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EDITORIAL NOTES.

A Fresh Cloud.

COAL deliveries have only just been resumed in many cases; and already a fresh cloud has appeared in the still gloom-streaked industrial sky. It was feared that the Minimum Wage Act would prove as disturbing a factor as the Coal Mines (Eight Hours) Act; and the very first decision fixing a minimum that is given, under the new Act, by a Joint District Board—South Wales—or rather by the independent Chairman (Lord St. Aldwyn), has produced the initial justification of the anticipation. In short, discontent with the decision is such that the men's representatives promptly rejected it, judicial decision though it be, and the Government, the coalowners, and the country generally were equally promptly threatened with all the pains and penalties that associated labour, with funds at its back, is able to inflict. It is clear—no one in his senses expected anything else—the coal miners will not tamely tolerate any decision that does not rigorously conform with their own predeterminations.

The minimum fixed in the case of South Wales is 3s. *plus* percentages—making 4s. 6½d. per day; which is 5½d. below the 5s. suggested by the men for insertion in the Act, but which suggestion the Government declined. The 5½d. is no doubt the real grievance. But the men put forward a point which is likely to appeal to the public if substantiated, and that is that many of them, under South Wales conditions, can only work four days a week, so that for these men the minimum only represents 18s. 2d. per week. Between actual and minimum, however, there may be a difference; but, with the minimum in existence, the men declare they are in a worse position than before the question of the minimum wage was raised. The developments of the position will be anxiously awaited, as the labour firebrands are already at work. There was a private conference of the men on Saturday; and prior to the conference, it was stated that it was proposed to ask the Miners' Federation, the railway men and transport workers, and the Labour Party to come to the help of the South Wales men in resisting the decision. The Labour members of Parliament, it was suggested, should be requested to obstruct all legislative business until redress of the new grievance has been obtained. These were the proposals; how far they are to be carried out has not yet transpired. But at Saturday's conference of the men, their representatives were instructed to suspend operations on the Joint District Board until a conference of the Miners' Federation is held on the 21st inst. No one, however, takes seriously the menace of another national stoppage, in view of the large expenditure of the Unions' monetary reserves during the recent strike.

The South Wales coal owners assert their determination to abide by the law. The men are equally resolved not to do so under present circumstances. Speaking of the Insurance Act a few days ago, the Chancellor of the Exchequer said that it is the duty of every man to abide by, and help to maintain, whatever is the law of the land. The suggestion has been made to the Chancellor that he should visit South Wales, and tell this, at the present juncture, to the miners. However, the coal owners are pointing to the losses that they have sustained—through business and in maintaining the mines in condition for a resumption of work—by the action of the miners in striking, and in carrying the strike to the length they did in the matter of time. The men, in fact, have themselves, it is argued, brought about conditions that justify a lower minimum than might have otherwise been the case. The Board of Trade returns in respect of our foreign trade show that this year, up to the end of April, less coal, coke, and manufactured fuel to the value of £2,834,412 have been exported; and this without the reduced quantity of fuel required at home due to the closing-down of industries, shorter hours of working, and lessened traffic—all due to the strike.

Chemical Manufacturers and the Gas Industry.

WHEN the House of Commons Committee of which Sir Henry Kimber is Chairman were considering last week the Bill promoted by the Bognor Gas Company for electricity powers, together with a Provisional Order which had been referred to them, and which was promoted by a Mr. Tate, who desired to make a private generating plant the nucleus of an electric scheme for the town, Sir Henry made the statesmanlike remark that the Committee could not give Mr. Tate a monopoly for his private interests. That is precisely what the Private Bill authorities are doing, and seem extraordinarily anxious to do, for the chemical manufacturers in connection with their expedition against the gas industry this session. The authorities are, in effect (whether they realize it or not we are, of course, not able to say), gradually building up a monopoly for the chemical manufacturers in the matter of the purchase of the liquid products of gas undertakings whose circumstances are not sufficiently extensive to justify them individually undertaking the working up of these products. An important question arises, Who are these chemical manufacturers for whom the Private Bill authorities appear to be working so sedulously? No one outside the circle of membership—we doubt very much whether the Private Bill authorities have the complete information in their possession—knows the names of the whole of the firms represented by the Alkali Manufacturers' Association. Somerset House does not appear to have the information; those manufacturers who are known to be members, and could give the names of the constituent firms, will not do so. It is (so far as we can gather) a sort of secret trade combination, about which the world outside itself is only permitted to know of its existence by name. This is the body, with no standing but that conferred by its own membership, that has moved the Private Bill authorities to an extent that is gradually but surely putting the purchasing power over all the liquid residuals produced by gas undertakings that have not the capacity for working them up themselves into the hands of these chemical firms, as well as the prospective control of the prices. A number of the firms are known; and certain of the distinguished representatives of these firms have seats in the House of Commons.

Instances occur again this week of what seems to the gas industry to be nothing short of an eager desire on the part of the Private Bill authorities to introduce the chemical clause wherever it is possible. The clause has found its way into the unopposed Dunstable Gas Bill. Then there is the Windermere Bill, which, though promoted by a gas and water company, is a water measure, and not a gas one. No matter. When it came up as an unopposed measure before the Lord Chairman, Mr. Gray (the Lord Chairman's Counsel) suggested that the chemical clause should go in. But it was explained that the Company has not the model clause as to the supply of fittings, so the part of the chemical clause which gives power to purchase materials for the maintenance or repair of fittings would be anomalous. Water Bill though this be, in order to get the chemical clause safely applied to even the little Windermere Company, Mr. Gray proposed that the model gas-fittings clause should be inserted. Our last information does not say whether or not conference with the promoters has brought this about. But what is the gas industry to think of this wholesale imposition of the chemical clause solely at the request of this trade organization composed of concerns the members of which are only out for private gain, and have not upon them the statutory obligations of gas undertakings? The members of the gas industry feel very keenly that an injustice is being done them, and that an unwarranted alteration is being made in their position as to residual products, which will place them largely in the hands of these private dealers and manufacturers.

The clause has also been inserted in the Wakefield Gas Bill; and now a petition has been lodged against the section

of the Birmingham Corporation Bill which is to give powers for the construction of new works on certain lands. The Bill has passed the House of Commons; but the Alkali Manufacturers' Association have awakened to the fact that this is an important Corporation Gas Department upon which to put the limitation, and so have petitioned against the measure in the House of Lords, with the intention of—if possible, for ever—preventing the department, whatever the lines of future development of its residuals products business, from relieving any of its smaller gas-supplying neighbours of their liquid products at prices probably better than the chemical manufacturers would be disposed to pay them, although (it may be) delivery to the latter would involve extra cost for carriage. We hope Birmingham will make strong resistance to this proposed limitation, not only in Committee, but, if it is eventually necessary, in the House itself.

Hot and Cold Weather Effects.

THE hot, light weather of last year had the same effect on the gas undertakings on the Continent as it did upon those of the British Isles. In Germany, it really had a worse effect than it did here; for the abnormal temperatures continued (according to the testimony of Mr. J. Horsley Palmer, the Chairman of the Imperial Continental Gas Association) right away up to Christmas—thus making the requirements for domestic heating of a very modest order. The result was that the over-all increase of consumption of the Association in the second half of last year was at a lower rate than usual. Another effect was that reduced values for coke crept into the conditions affecting the half year, though other local conditions prevailed that enabled the Association to clear out accumulations of stock at the diminished price. But the weather has been more kindly disposed to the gas business during the current year. A matter upon which the Association are to be heartily congratulated, and upon which the managements of certain gas undertakings at home will feel a little envy, is that—despite the fact that, for part of the second half of last year, the waterways in Germany were low for transport purposes—before the miners' strike started the Association had managed to get their contract stocks from this country into store at their works, and so were safely fortified against danger. This was not the fortunate position of a number of works in England, that reported arrears of their scheduled delivery quantities. The strike, however, has curtailed the shipment period this year for the Association; and they will again require the hearty co-operation of their contractors to assure good stocks for next winter, inasmuch as they have to face the contingencies of a long drought making for a period the waterways impossible means of transport, and of next winter setting in early, and the waterways thus becoming ice-bound. Of course, the Association have uncertainties of a character in the matter of transport that have not to be met by gas-works at home; hence the anxiety to have contracts fulfilled with expedition and at favourable seasons. Among other matters treated upon by Mr. Horsley Palmer in his interesting address to the proprietors last Tuesday were the new extension of the Hanover contract, and the question of pension and other workmen's funds. In the latter respect, the Association have a heavy total liability to meet, as will be seen from the report of the proceedings at the meeting.

Furnace and Heat Control.

THERE was no need for Mr. H. D. Madden, of Cardiff, to ask pardon for the self-assumed shortcomings of the paper he read before the Welsh Association last Thursday. The fact that there is so much loss of heat, waste of fuel, and local destruction going on in many retort furnaces and settings to-day is more than sufficient reason for the subject being investigated and discussed more liberally than it has been in the past. Professor Lewes, in one of his Cantor lectures last December, alluded to this subject of the uneconomical conditions that exist in retort furnaces and settings; and he, like Mr. Madden, urged the importance of endeavouring to effect economy by the production of more uniform conditions hour by hour within the furnace and settings, and by the prevention of heat losses. No very great progress, however, will be made in producing furnace economies without all the factors that produce the uneconomies are investigated and ascertained; and in connection with retort furnaces and settings, this has not yet been thoroughly done. This is possibly through the complex character of the conditions which prevail.

In connection with heat losses, Mr. Madden speaks of loss by radiation, heat removed in the ashes and clinker, and heat carried off by the waste gases. Professor Lewes goes further, and speaks of the heat that is conducted away by the valuable products resulting from the distillation of the coal in the retorts themselves. The distribution of the heat generated in the process of carbonization is of an extensive order; and, apart from this, a point that is hostile to the proper study of the whole question is that the conditions in furnaces and settings are very inconstant, through the contrarieties produced in the cycle of operations by the feeding of cold raw coal in bulk periodically into the retorts, by the withdrawing of the incandescent coke, by the clinkering and recharging of the furnace, and by the variations occasioned by combustion in the fuel-bed itself. However, dealing with the losses that are most obvious. Loss by radiation is a matter that can be minimized, and has been minimized for years by some gas engineers, by structural means; and the importance of adopting such means has been proved with horizontal, inclined, and vertical settings. It is, of course, impossible to avoid some heat being removed by the ashes and clinker; and it is impossible to prevent loss through the waste gases. This loss could be lessened if one could govern, and reduce to something like uniformity, the present variable pull of the chimney shaft. There is the loss of heat through the products of distillation. Here, again, there are no known means of considerably reducing the heat carried away by the gas and liquid products, except by preventing the ascensions and connections of the bench becoming unduly heated by radiation, and thus affording channels of escape that are not excessively hot.

The solid product coke is quite another matter. The useful saving of some of the heat energy contained in the incandescent coke can only be accomplished by transferring the heat from the coke to the setting itself. This could be done by utilizing the incandescent coke in the furnaces; but fortunately only a portion of it is wanted for fuel (indeed, one of the main objects of furnace control is to lessen the quantity of fuel needed for a given amount of productive work). It can also be partially done by absorbing a portion of the heat of the coke for some serviceable end before it leaves the setting. This, however, must be accomplished without unduly affecting the temperature of the retort itself. Two ways of so utilizing a portion of the waste heat are actually in operation to-day; and they are the only practical ways that have yet been advanced for producing economy in this regard, in place of the barbarous waste of heat that has heretofore been allowed to continue through crude methods of quenching. In the Glover-West system, the coke in the process of being discharged has a large part of its heat retained in the setting by transferring it to the secondary air; and in the Dessau system as fully worked, the slow steaming towards the end of the twelve-hour charges utilizes some of the heat of the incandescent coke to valuable purpose. But the latter system has the effect of increasing the fuel account; whereas the former system contributes to the lessening of the quantity of fuel required. But the ultimate economy is only to be found in the work done as represented by gas production.

The furnace itself presents difficulties, owing to the instability of its conditions; but it is in connection with the furnace that there is important work to be done to the realization of economies, both fuel and structural. Mr. Madden states the factors that should govern its gas-producing efficiency. He states, too, the evils of the variable conditions that obtain in the furnace, between clinkering and clinkering, and between the replenishings of the fuel-bed. But he has not perhaps gone so deeply into the matter as he might have done. It is, however, a subject that may receive further investigation in the immediate future; and we may have an opportunity of returning to it again before long. Meanwhile, we will not discuss it, save to say that Mr. Madden points to the importance of a better control over the primary air supply, and has successfully done something towards retarding the extraordinary activity of the fire immediately after clinkering, in order to reduce the consumption of fuel, and to curb the otherwise violent rush of combustible gases into the setting during clinkering times, with its detrimental effects upon the structural parts. Mr. Madden's method of checking the waste of carbonic oxide, and therefore of fuel, has the virtue of simplicity. He does it by introducing—just previous to cleaning out the furnace-

grate, and removing the clinker—a blanket of breeze on top of the fuel-bed, through the furnace charging-door. The cleaning of the fire and the shaking-up of the fuel by the removal of the clinker causes the breeze on top of the bed of coke to work downwards through the mass of incandescent fuel, and fill the interstices between the individual lumps. This exercises a retarding influence upon what would be otherwise the free rush of primary air through the fuel; and, by the time the breeze is consumed, the fire has largely settled down to normal working—providing all the other conditions are normal. It is because all other conditions are not constant in the producer that a clockwork arrangement to govern, with fixed gradation, the primary air supply would not cover all that is necessary in the way of regulation. Mr. Madden secures very desirable results in fuel economy, labour saving, and moderating structure depreciation. But it strikes us as being a somewhat cumbrous, though it is undeniably a simple and cheap, way of attaining the objects sought. However, as we have said, the subject is one that is worth further investigation; and we may have occasion to allude to it again before long. The value of fuel, labour, and structural economies in the producers of retort-settings is not sufficiently recognized in some quarters; and it is a good technical topic upon which to concentrate some amount of attention.

Small Works and Uniform Quality.

It is not the degree of the quality of gas that matters so much to-day as the uniformity of the quality of the supply; and this applies equally to the supply by small gas-works as to the supply by works of large capacity. Gas undertakings, large and small, depend for their commercial stability upon the satisfaction of the consumer with the results of the use of the commodity supplied to him; and therefore gas undertakings large and small must of necessity, if they desire to do the best possible, and through the "best possible" secure the largest measure of trade protection, take steps to guard against gas of variable quality. This was the proposition that formed the foundation of the paper Mr. Evan Rees prepared for the meeting of the Welsh Association on Thursday last; and he directed his remarks especially to the managers of small works, though nearly all that is in the paper applies with equal weight to the managers of large works. The only difference is that the relation of the argument for chemical control of the gaseous product in the case of the latter is so much wasted effort, as they are already fully equipped for such control, though not in all cases is the fact any guarantee of a uniform quality of the prime commodity. The manager of the small works is not so circumstanced; and the manager of the small works is apt to think that such things are not ordained for him. He has his limitations not only personal, but in environment. Time cannot be devoted to chemical investigation of the order that is time-absorbing; and a running expenditure for a competent chemical assistant is not to be entertained.

Of recent years, however, as Mr. Rees points out, invention has come to the aid of the manager of the small works; and has given him automatic assistants that will keep him informed "on sight" as to all that it is necessary to know in matters appertaining to quality, which information is the highway to the maintenance of the desirable uniformity. Practically everything upon which it is necessary to be informed in connection with product can be ascertained automatically or otherwise rapidly by the various aids now at command—whether it be the specific gravity, the illuminating power, the calorific value, the purity, or the composition of the gas. There is no necessity to elaborate the point as to the importance with modern gas-consuming appliances of this uniformity of quality, which, as Mr. Rees says, can be secured by the means available to-day as readily by the manager of the small works as by the manager of the large ones. Mr. Rees puts the pertinent question, To what extent does the present practice of prescribing and testing for illuminating power as it prevails in most small works guarantee the efficiency of gas for its more modern uses? When Parliament can answer this question, Parliament will facilitate without delay a change of the standard of quality from illuminating power to calorific power; and when calorific power is introduced as the standard, in every grade of works where chemical control is not fully practised now, the spirit and influence of such control will, we believe, obtain much greater hold and power. But there should be no waiting for such times as the actual change. Looking perspectively at the interests of the industry, the present and sustained satisfaction of the consumer is a material consideration. There is indication in the paper before us as to the apparatus that is available for automatic control, though naturally the productions of all manufacturers could not possibly be mentioned by the author. The economic and commercial values of chemical control are also dwelt upon; and without a reference to these aspects of the subject, the paper would have been lacking in the completeness that is reasonable within the latitude of an Association contribution. A paper like this ought to bear fruit in the quarters to which Mr. Rees directed its message.

Surface Combustion Developments.

No subject in physical science and in industrial economics is at present attracting so much attention in the realms directly concerned as that of surface combustion, which subject Professor W. A. Bone has made exclusively his own in the scientific aspects of its present development. All interested in the problems of heating are wishful to see and hear of it; and wherever Professor Bone has lectured upon it, and demonstrated its potentialities, in this country or abroad, large and enthusiastic audiences have assembled to hear and to witness. This cannot be wondered at when one considers the important part heat has in our daily life and progress—industrial and domestic. Everybody naturally wants to know how to obtain more of it from the expenditure of fuel. Hence it came about that a big and appreciative audience was present in the Examination Hall of the Leeds University last Tuesday when Professor Bone, upon the invitation of the University Cavendish Society, once more treated of the subject. Manufacturers, metallurgists, engineers, chemists, and students gathered there; and there is no question that they were duly impressed with the great advantages of gas as a fuel under the new system. Professor Bone has rarely publicly dealt with this theme without having to announce some new development—either in application or economy. The range of application appears to be unlimited; at any rate, it is not yet definable. Those engaged in the work of practical application to-day seem nearer the threshold of proving domestic utility than they have hitherto been. New diaphragms are being developed which hold the possibility of application to such purposes as grilling, roasting, and toasting; and water-heating for baths is now spoken of. Having regard to the degree from and to which the temperature of the water was raised in the test quoted towards the end of our report of the lecture, the quantity of water raised in temperature, and the expenditure of fuel, the result shows economical work and high efficiency. Additional work has been done in the direction of producing further heat economies in the industrial applications of the system by utilizing the heat of the waste gases. We saw this done in the development of boilers by applying the waste gases to the heating of the feed water; and now we see it in the preheating of the air supplied to the muffle furnaces constructed on the system. To gain an economy of 20 to 25 per cent. of fuel in this way is highly important. The Skinningrove boiler which has already been described and illustrated in the "Journal," it is interesting to learn, has been in continuous operation ever since it started, save for an interval during the coal strike, when all the plant was let down. Big developments in gaseous heating would, Professor Bone is certain, be promptly effected, if town gas was generally available at Widnes and Sheffield prices.

Trade Union Funds.

The determination to meet in some way the effect on the disposal of trade union funds of the well-known Osborne judgment has led to the presentation of a Bill by the Attorney-General (supported by the Home Secretary, the Postmaster-General, and the Solicitor-General). This measure, which is to be known as the Trade Unions (No. 2) Bill, is stated to have for its purpose "to amend the law with respect to the objects and powers of trade unions." There are eight clauses; and under the third it is provided that the funds of a union may be applied to political objects under certain conditions. That is to say, they shall not be so applied unless rules (to be approved by the Registrar of Friendly Societies) are in force providing (1) that such application is approved as an object of the union by a resolution passed on a ballot of the members; (2) the payments are to be made out

of a separate political fund of the union, and any member giving notice that he is unwilling to contribute shall be exempted from any obligation to do so; (3) any member who is so exempted shall not be excluded from any benefits of the union, or be placed in any respect, either directly or indirectly, under any disability or at any disadvantage as compared with other members of the union (except in relation to the control or management of the political fund); and (4) contribution to the political fund shall not be made a condition of admission to the union. If the political fund is not a separate levy, exempted members shall be allowed an equivalent deduction from their general contribution. The Bill includes as a schedule a form of exemption notice which a member may send to his union on being informed that a majority has decided to further certain political objects. It should be stated that the political objects to which this section applies are: The payment of any expenses incurred, either directly or indirectly, by a candidate or prospective candidate for election to Parliament or any other public office; the holding of any meeting, or the distribution of any literature or documents, in support of any such candidate or prospective candidate; the maintenance of any person holding a public office; in connection with the registration of electors or the selection of a candidate for Parliament or any public office; or the holding of political meetings of any kind, or the distribution of political literature or political documents of any kind, unless the main purpose of the meetings or of the distribution of the literature or documents is the furtherance of statutory objects within the meaning of the Act.

OBITUARY.

SURGEON-COLONEL WILLIAM TAYLOR.

The Cardiff Gas Company, and a large circle of personal friends, together with the general community of the city, have sustained a loss that will be long and severely felt, by the death of Surgeon-Colonel William Taylor, of Llandaff, who passed away on the steam yacht "Vectis" last Wednesday afternoon, near Cattaro, on the Adriatic, and was buried at sea. Towards the end of April he left Cardiff for Marseilles, where, accompanied by his eldest son, he embarked for a trip to the Adriatic. At the time of his departure from England, his health (though it had been known for some time that he was suffering from a weak heart) was apparently quite satisfactory; but a subsequent cablegram conveying the news of his serious illness had somewhat prepared those at home for the final shock. Those who knew the deceased gentleman personally, and recall his unflagging energy and his firm grasp of the numberless matters to which he gave his attention, find it hard to believe that he was, at the time of his death, 82 years of age. Such, however, was the case; and though born near Jedburgh, he had been connected with Cardiff for a period of no less than 79 years. His career is one long record of activity—an activity which has only come to an end with his life. Enjoying a wide reputation as a surgeon, he also found time to enter largely into the public life of the city of his adoption. In 1877-8, he filled the office of Mayor of Cardiff, and was an Alderman for a lengthy period; while at the time of his death he was the oldest member of the Cardiff Magisterial Bench, and had been for many years the Chairman of the Licensing Committee. Good service was also rendered by him in the cause of education. Another position he had occupied was that of Chairman of the local Water Company, before the undertaking was acquired by the Corporation—a step which he was instrumental in bringing about.

It is, however, with Dr. Taylor's long connection with the Cardiff Gas Company that we are chiefly concerned here; and this forms an important chapter in an eventful life. For over a quarter-of-a-century he was a Director of the Company (having joined the Board in 1885); and from 1908 until his death he occupied the position of Chairman. It is interesting to note the recorded fact that for many years before 1885 he had had some connection with the gas-manufacturing industry, inasmuch as he married in 1858 a daughter of Mr. Lisle, the owner of Cardiff's first gas-works and foundry, which stood at the corner of St. Mary Street, now occupied by the Great Western Hotel. As was his habit with everything he undertook, Dr. Taylor determined, on joining the Board, to thoroughly master the details of the Company's operations and of gas-works practice generally; and, as was also usual with him, he thoroughly succeeded in attaining his object. He saw the Company develop in an extraordinary manner—and materially assisted it to do so. In all he did, there was only one place for him, and that was in the van of progress. When first he became a Director, the concern was a comparatively small one, with a sale of gas of something like 400 million cubic feet per annum; while to-day the output, at well over 1200 million feet, is more than three times as much. In many ways he showed that the personal welfare of all the employees was very near to his heart. Among both officers and men he enjoyed great and thoroughly well-deserved popularity. With the growing output of gas and altering conditions of supply, improvements and extensions are the order of the day at Cardiff; and quite a large amount of work was done in these directions during the four years that Dr. Taylor occupied the chair. New purifiers and sulphate of ammonia plant have been erected; while the retort-house has been much extended, and new West power stoking machinery installed. There is also being put in a Humphreys and Glasgow carburetted water-gas plant, of a capacity of 2,400,000 cubic feet per day, fitted with coke-handling plant. In the distribution department, a handsome show-room has been opened in a main thoroughfare; and an extensive high-pressure lighting scheme has been inaugurated. In addition to all this, a boosting plant has been laid down at Grangetown, and testing, repairing, and other workshops have been erected and extended at Bute Terrace. Thus there has been a busy time both on the manufacturing and the distributing side of the undertaking.

Once having made up his mind on any subject, Dr. Taylor fearlessly pursued the course he had decided upon; and he was one of the best Directors that an official could wish to have at his right hand, because, as has been shown, he invariably supported the management in a policy of progress. Up to the last he retained his faculties in a very remarkable manner. Though ill at the time, he followed with the closest attention all the phases of the recent coal strike, and their bearing upon the undertaking of which he was at the head. His mastery of statistics all who came in contact with him readily admit; and his knowledge of chemistry proved of very great assistance to the Company. Being a scientific man, he was, of course, able to fully appreciate modern developments in the manufacture of gas. The men to whom he was so devoted will long treasure the recollection that three or four weeks ago he kicked-off at a football match between rival teams of the Company's two stations.

Dr. Taylor was appointed a Vice-President of the new British Commercial Gas Association—a body whose objects enjoyed his highest approval. It was, in fact, largely owing to his influence that the Cardiff Gas Company joined the movement. Always a great believer in pioneer work, he was firmly convinced that the inauguration of the British Commercial Gas Association would be beneficial both to his own Company and to the industry in general.

While sorrowing over their loss, Dr. Taylor's relatives and many friends (both in the Cardiff Gas Company and outside) will derive consolation from reflecting upon the good that he did.

JOSEPH TIMMINS.

We regret to record the death, on the 4th inst., at his residence in Wigan, of Mr. Joseph Timmins, who for a quarter-of-a-century occupied the position of Gas Engineer to the Corporation of Wigan. The deceased gentleman, who was sixty-nine years of age, had had an interesting career, having in his early manhood served some time in China, and later occupied responsible positions in various towns in this country. He had been suffering from heart affection for some considerable time, and had on several occasions been granted leave of absence, so that, if possible, he might benefit by change of air and environment. But any improvement in his condition was only of a temporary nature; and the trouble from which he had all along suffered was the cause of the final collapse.

Mr. Timmins was well known throughout the country as a gas engineer, having held important positions at Wigan and Leigh, in Lancashire, at Runcorn and Widnes, in Cheshire, at Dudley, in Worcestershire, and at Shanghai. After receiving his education at the Grammar School of his native town of Dudley, he was apprenticed as a mechanical engineer at the well-known engineering works of the Earl of Dudley, where he laid the foundation of a practical knowledge in engineering that served him in good stead in his after-career. On the completion of his apprenticeship, he availed himself of an offer made to him to go to Runcorn to take charge of work in connection with the extension of gas-works for Mr. E. Timmins, and he was occupied there for some two years. When he left the Cheshire town, it was to go to Shanghai, where he had secured the position of Engineer in connection with the construction of large gas-works, and where he stayed for nine years as Engineer and Manager, at the works which had been completed under his supervision.

Returning to England, Mr. Timmins obtained the position of Constructing Engineer to the Tharsis Sulphur and Copper Works at Widnes, and remained there for two years, at the end of which time he received the appointment of Gas Engineer and Manager at the gas-works of the Leigh Local Board. While at Leigh, between 1874 and 1887, he erected new works for the local authority, and, in addition, planned and carried to completion a new scheme of water supply for the township. It was with fine credentials that he left Leigh, after thirteen years' work, to go to Wigan in 1887, on obtaining the appointment of Gas Engineer and Manager to the Corporation.

Under Mr. Timmins, the gas undertaking at Wigan progressed in a remarkable manner. The works soon had to be extended, and before long very substantial profits were being made and handed over in relief of the district rates. When he went to Wigan, the population of the town itself was rather more than 50,000, whereas it is now about 90,000; the adjoining township of Pemberton, which was supplied with gas from the Wigan Corporation plant, having been amalgamated in what was known as the Greater Wigan scheme.

The number of gas consumers during his tenure of office as Gas

Engineer has been multiplied by four; the number in 1887 being 5298, against 22,978 at the present time. This increase has been recorded in spite of the fact that the Corporation have for some years been supplying electricity, from the works built in connection with the town tramway system, as well as gas for lighting purposes; so that Mr. Timmins' department has had municipal competition to contend with. Then the price of gas during his management has been reduced from 3s. 1d. to 2s. 10d. per 1000 cubic feet for lighting purposes, and to 2s. 1d. for cooking, heating, and motive power—these charges being subject to discounts; but, in spite of these reductions, annual profits have been made. It is estimated that the total net profits ranging over the twenty-five years, including the gas supplied free for public lighting within the borough, have exceeded £300,000; and this large sum has been handed over in relief of the rates.

The quantity of gas made at the Wigan works during Mr. Timmins' first year was 232 million cubic feet, compared with the 487 millions in his last year. In 1887, the number of public lamps totalled 1668, against 3290 at the present time. During the same period the length of mains has grown from 73 to 132 miles. The quantity of gas manufactured per ton of coal carbonized has also gone up from 10,000 to 11,500 cubic feet; the average cost of coal in 1887 being 8s. 6d., against 11s. 5d. during the last financial year.

Mr. Timmins joined the British Association of Gas Managers in 1875, passed into the Gas Institute, and was a member of the Institution at the time of his death. He was admitted into the Manchester District Institution of Gas Engineers in 1876; and as an associate member of the Institution of Civil Engineers in 1889—being transferred to the membership list in 1898.

The funeral of the deceased gentleman took place on Wednesday, and was attended by the Mayor and members of the Corporation—employees at the gas-works acting as bearers. The interment was at the Leigh Cemetery. Among those who were present in a representative capacity were Mr. Thomas Duxbury, of Manchester, Mr. Samuel Glover, the President, and Mr. W. Whatmough, the Hon. Secretary, of the Manchester Institution of Gas Engineers, and Mr. W. S. Haddock, of Warrington.

The floral tributes, which were very numerous, included wreaths from the various departments in connection with the Wigan Corporation gas undertaking.

News was received yesterday of the death last Thursday, at Wiesbaden, of Mr. Albert Domeier, who years since was well known in the chemical trade connected with the gas industry. Mr. Domeier's name is still associated with the firm of Thom, Domeier, and Co., although he long ago severed active participation with English trade interests.

PERSONAL.

Mr. George Spencer Bower, K.C., son of the late Mr. George Bower, of St. Neots, has been elected a Bencher of the Inner Temple.

Alderman Edward Holt, J.P., has been appointed Chairman of the Manchester Water-Works Committee, in succession to the late Sir Bosdin Leech. Alderman Holt was Deputy-Chairman of the Committee; and this position has now fallen to Alderman Thomas Smethurst.

Mr. Thomas Loftos, the Clerk and Solicitor to the Fylde Water Board, has intimated his intention of retiring when the Royal Assent has been given to the Bill which the Board now have before Parliament. Mr. Loftos was appointed in 1897; and it is understood that his retirement is mainly due to considerations of health.

Mr. H. J. Gooch, the Hon. Secretary of the Transferred Officers' Society of the Metropolitan Water Board—a body consisting of the officers of the London Water Companies who were taken over by the Board—has lately been presented with a handsome gold watch, in recognition of his services. Mr. Gooch has done a great deal to promote the amicable feelings subsisting between the Board and the officers.

Mr. Harold Tong has resigned his position as engineering assistant in the Water Department of the Bolton Corporation, having accepted an appointment as Water Engineer to the Antofagasta (Chile) and Bolivia Railway Company. At last week's meeting of the Water-Works Committee, regret was expressed at Mr. Tong's impending departure, and a minute was placed in the books recording the Committee's high appreciation of the valuable services he had rendered to the department, and their best wishes for his future welfare.

At the meeting of the Ipswich Town Council last Wednesday, the salary of Mr. C. W. S. Oldham, the Water Engineer, was increased by £50 per annum, as from the 31st of March last, on the unanimous recommendation of the Water Committee. In its support, it was stated that Mr. Oldham had shown himself a very capable and trustworthy officer, and that his knowledge and experience had contributed largely to the successful finding of water and the construction of the borehole and well at the new pumping-station, and enabled the Committee to dispense with outside expert assistance.

NOTES FROM WESTMINSTER.

There is less interesting matter to be dealt with this week; but as the notes succeeding show, what there is to write about is not without point. The Committee rooms will not yield much more this side of Whitsuntide, as there is talk of adjourning for the usual recess from Wednesday May 22 to June 4.

Standard Price, Maintenance, and Capital.

There was a tough fight over the Wakefield Gas Company's Bill; everything practically that the Company proposed in the measure being objected to by the Corporation. The Company made a good defence of their proposals; but their suggested capital powers and the existing standard price of gas were, in our opinion, cut down unjustifiably. But, as it happens, the shareholders will not actually be injured by what has been done, except in that, as Mr. Corbet Woodall put it, standard prices should be held inviolable, seeing that those shareholders who have purchased on the strength of a 3s. 6d. standard are deprived of the margin of advantage that they possess between the present dividends and the standard price. The standard price has been reduced to 3s. This bears upon another point. The Company have not made use of the old standard in paying the dividends that they might have done; but they have been spending liberally on repairs and maintenance, thus helping to keep down capital, instead of, as Mr. W. Cash pointed out, paying high dividends. This is to the advantage of consumers present and prospective. But the act was spoken of almost as a grave misdemeanour on the part of the Company. Last year they charged 12·06d. for repairs and maintenance; but they were not paying their full dividends. Mr. E. H. Stevenson, for the Corporation, put it that they ought not to spend more than 5½d. on repairs and maintenance. Mr. Cash, on the other hand, on the strength of his wide experience, asserts that 6d. is not enough in these days. As we said last week, consideration in this connection must be given to modern conditions in connection with distribution requirements; and those modern conditions cannot, and must not, be governed by the circumstances of times long since dead. Mr. H. Townsend, the Engineer and Manager of the Company, emphasized this, as did also Dr. W. Statter, the Chairman. The other point is the cutting-down of the proposed capital powers. The Company have £12,200 unissued capital; and they asked to raise their borrowing powers on the present capital to one-third—giving them £37,325. They also requested £52,000 of additional capital, with one-third borrowing (£17,333). This scheme would have supplied a total of £118,858, including the present unissued capital. But the Committee curtailed the £52,000 to £30,000, which carries £10,000 borrowing powers—reducing the total of £118,858 by £29,333, and making it £89,525. We do not think the Company's proposals were too extravagant; but there was this against them. Parliament is strongly averse to statutory companies keeping away from its review too long; and it was 1877 since the Wakefield Company were previously in Parliament. The reduction of the capital is an assurance that they will have to appear again earlier than they might have done had they had the additional £29,333 granted. Arising out of this point, Mr. Stevenson submitted, as one reason why the capital asked for should be reduced, that the percentage rate of increase in gas consumption has been diminished during the last thirty years. It would have been better had he shown the volume increases for each of the three decades, to see the relation that they bore one to another.

Conversion and Other Points.

The Company are in a peculiar position in regard to their present capital. They have a very inconvenient variation of stocks; but, under the sliding-scale, the stocks are all entitled to the same increment or decrement of dividend with price changes. There was a pretty conundrum here, as to how to consolidate and do justice to the respective shareholders. The scheme the Company devised as the only way they could find out of the difficulty provided for two stocks, instead of one as is the usual practice. The expert advisers of the Company could not discover any other solution of the problem. The Corporation representatives opposed the departure from ordinary practice. Mr. Honoratus Lloyd, K.C., who was one of the Counsel for the Company (with Mr. Clode and Mr. A. M. Paddon), in a moment of sporting fervour, offered to his learned friends and the witness in opposition a handsome prize, if they would show the Company how one stock could be launched, and justice be conferred on the holders of the present varied stocks. But no one won the prize. No better scheme was offered; so it stands. A piece of antiquity attaching to this Company is that a uniform price has to be charged for all purposes. They are now to be allowed to charge a differential price, with the Corporation supplied for public purposes at the lowest figure charged for private lighting. The Company get the reduction of illuminating power, and the standard burner. These have lost favour as bones of contention. Again we have an example of outside authorities seeking for a testing place and powers. The out-district of Stanley asked for testing rights and a station; and (there is a similar instance in the York case) Lord Barnard's Committee have given Stanley what it wants, but the expense of providing the station is to be borne by the district. A point that is being laid hold of by opponents this session, in addition to the charges for repairs and maintenance, is that of pressure. It has already been raised several times this

session—the opponents holding that 8-10ths is now insufficient, and that it should be 20-10ths. Gas authorities may be left to look after their own interests in this matter. The Company have dropped some of the territory they contemplated annexing to their area of supply. But Crofton, Walton, Chevet, and Woolley have been retained; and to prevent Wakefield consumers suffering from the supply of Woolley, this district is to be charged a price 6d. higher than Wakefield.

Electricity Supply by Gas Companies. Under proper regulation, if there is a demand for electricity in a small town, it can be met better, in the public interests, by the local gas company than by an independent concern. It is better for all parties, owing to the more economical working that can be achieved, in administration, generating costs, upkeep of mains, and so forth. The question was again raised before Sir Henry Kimber's Committee on the Bognor Gas Company's Bill, which asked for electricity powers to be conferred. A Provisional Order was also promoted this session by a Mr. Tate, who has a small private electricity generating plant for the supply of the theatre, arcade, and Kursaal; and he wanted to launch out on to general supply with an independent concern. But the weight of evidence was in favour of the Gas Company. Expert electricians, in the persons of Mr. Campbell Swinton and Mr. A. H. Dykes, told the Committee how difficult it is for small electricity concerns operating without any base but their own to make a living. What they actually make is a loss, though high prices are charged, and proper revenue charges and reserves are neglected. With a prosperous established concern like a gas company, having site, works, fuel, staff, and distribution facilities already and always available, the case is different. Mr. Dykes made an interesting statement in the course of his evidence, to the effect that, in the case of electricity generating stations with which he is associated and which use oil-engines, their cost is 0·29d. per unit, as against 0·14d. for a gas company using their own gas and coke. Mr. Tate saw the balance of local advantage was on the side of the Bognor Gas Company, though it has taken time, trouble, and expense to bring to a head this knowledge. An agreement was consequently effected, whereby the Gas Company are to lay mains within two years, are bound not to raise the price of energy above 6d. per unit to consumers at present supplied by Mr. Tate, and are to supply Mr. Tate with current during daylight hours at 1½d. per unit. The Company are also to purchase his plant under the Lands Clauses Act, and to pay him £250 towards the costs of promoting the Provisional Order. So another Gas Company will soon be the sole suppliers of light, heat, and energy by subterranean transmission in the town in which it operates.

Woking Gas. There was not much beyond local point about the Bill of the Woking Gas Company, who are in a prosperous position now, though their history a few years ago showed alternations of troubled and of smooth waters. By the aid of the evidence of Mr. A. F. Phillips, Mr. E. H. Stevenson, and Mr. E. L. Burton, the Company got practically all they wanted, with the exception of land for new works. But in this case the Marquis of Bristol's Committee gave them an easement between the canal and their present works for the conveyance of coal by tramway or aërial means. It was common land that the Company sought to acquire; but the public seem to have a particular fancy for frequenting this part of the common, though it is adjacent to the gas-works. Among other changes that have been effected in the Bill, the Company voluntarily dropped the proposed standard price from 5s. to 4s. 6d. They also agreed to leave Chobham to the Ascot Company; and the Ascot Company have reciprocated by giving Bisley to the Woking Company. The Surrey County Council were at the same game in this case as they played in connection with the Wandsworth Bill; but the Committee on the Woking Bill were more just than Lord Ribblesdale and his Committee on the Wandsworth Bill, for they declined to impose a minimum depth of 3 feet for new mains. Dr. Samuel Rideal was present supporting an abortive proposal for a testing-station away from the works.

Private Tunnels and Main Laying. The case of *Schweder v. Worthing Gas Company* brought to the surface, as we said last week, the need for a modification of the Gas-Works Clauses Act, 1847, by providing that any tunnel, arch, vault, or building beneath the surface of any street shall be deemed to be a tunnel to which the provisions with regard to the breaking-up of streets for the purpose of laying pipes shall apply, and shall not be deemed to be a building within the meaning of section 7 of the General Act. Clauses for bringing about this modification were inserted in the Christchurch and Herne Bay Bills. When the first-named Bill came before the Marquis of Bristol's Committee, it was stated that the Lord Chairman had the proposed modification under consideration. On the Herne Bay Bill coming up for review by the Lord Chairman last week, it transpired that he has since considered the matter, and thinks the amendment unnecessary. If, however, similar cases arise in the future, it will be necessary he says to reconsider the matter from the point of view of general legislation. So the modification is not to be allowed.

Chemical Clause. It is a pity the Lord Chairman did not come to a similar conclusion in connection with the movement of the chemical manufacturers—that the alteration they desired in what is practically general gas law was a matter that should be discussed from the point of view of general legislation rather than be dealt with in the extraordinary manner that has been witnessed. The week's developments of this question are noticed in the editorial columns.

ELECTRICITY SUPPLY MEMORANDA.

The Postulation of Mr. John Christie—Costs and Omissions—Big Rentals and a Quick Return—Indestructibles and Destructibles—A Weekly Inspection Necessary—A Miserable Business—The Yellow Flame Arc—The Resuscitated Bill - Mean Contrasts.

THE Brighton Corporation Electricity Committee intend to enter upon the electric cooking business in a solemnly tentative manner. Then if it fails, the department will not be much the worse off; and the electric cooker manufacturers will not be overpowered by the wealth they will secure from what is done by Brighton. This is a very sensible course. The Committee have approved of a request by Mr. John Christie, the Borough Electrical Engineer and Manager, to be authorized to expend £250 from the reserve in purchasing a suitable selection of electric cooking apparatus. The only objection to this little flutter is the unsound financial procedure in drawing money from the reserve for such a purpose. However, the report accompanying Mr. Christie's recommendation is as interesting in what it does not say as in what it does say. His points may be followed seriatim. We can see the beatific look on Mr. Christie's face as he wrote the words that, with electricity at 1d. per unit, it will effectively perform all the ordinary cooking operations of the average household at a cost comparable with that of doing similar work by existing methods. Not a tittle of proof accompanies this statement; not a word as to whether Mr. Christie includes with baking all the boiling and all the hot-water required for meals and for culinary operations. Had it been our lot to be on the Electricity Committee of the Corporation of Brighton, we should have instructed the technical adviser to be a little more explicit, and not so niggardly in the matter of confirmatory evidence. Proceeding, it is asserted that electricity "has the additional advantage of convenience, cleanliness and improved flavour of the meat so cooked." There is a little roughness in composition here. We fail to see just why the electricity should have the advantage of the "improved flavour," seeing that the user pays for the electricity. It would be a courteous act on the part of Mr. Christie if he would explain in what way electricity has additional convenience and cleanliness. Is the convenience expressed in the time occupied in the various operations? Then, it would be interesting to be informed as to the way in which there has been a providential intervention on behalf of electricity which enables this form of energy to impart an improved flavour to the food that is cooked by the heat of the units used.

The question of cost is perennially interesting. Mr. Christie has something to say upon it; but that something is very fragile in regard to the enlightenment it affords. He states, with the tact of one advertising his wares in the town market-place, that "an ordinary household of (say) six persons using this method of cooking will, *with reasonable care*, consume about 2000 units per annum or from £8 to £10 worth of electricity. Of course, no one knows by what superhuman power Mr. Christie has been able to gauge what will suffice for any ordinary household of six persons other than those with which he may have come into contact. The wants of households of six persons vary in prodigious degree. In the second place, it is only "with reasonable care"—a quality that is not obtainable with the modern queen of the kitchen—that the consumption of electricity for cooking for a household of six persons will be kept down to about 2000 units at 1d. a piece, or from £8 to £10 for current. Mr. Christie fails us again just as the supply of electricity sometimes fails its patrons, and neglects to say whether his estimate of £8 to £10 worth of electricity, used with reasonable care, includes everything in the way of baking, boiling, grilling, stewing, frying, and hot-water provision for all meals and culinary purposes. Then the financial obligation of the household of six persons will not end at the £8 to £10 of energy. The purchase of the necessary apparatus Mr. Christie puts at £10 "or" £15—50 per cent. difference between his two figures—the repressive power of which sums on the enthusiasm of the ordinary householder he recognizes as being of an amazing character. We see that Mr. Christie's £250 is to purchase 25 ovens; so that the price of £10 each does not embrace wiring and fitting-up on the consumers' premises. However, he suggests that the annual rentals shall be (say) 20 per cent. of the list price payable quarterly in advance, which does not look as though he is prepared to trust the hirers very far. Rent is usually paid at the end of a quarter. Supposing we reckon the mean of £10 and £15 cost, 20 per cent. on this will run out to £2 10s. per annum, to add on to the £8 to £10 for current to accomplish—what?

Further, Mr. Christie only proposes to let on hire what he terms the "indestructible part of the apparatus—such as the heating-elements, the ovens, grills, grease-pans, &c." This is interesting. "Indestructible!" Does Mr. Christie really believe in the aptness of this term as applied to such things as heating-elements? If, too, indestructible, why place the rental at such a high figure as 20 per cent.? It is patent that he is anxious to see the money back rapidly. Anyway the point is of interest as showing the views of an electrical engineer. These "indestructible" things that Mr. Christie is so anxious to see the users pay for quickly

through their rentals, require something of a more destructible nature to be used in conjunction with them—such as kettles, stewpans, saucepans, frying-pans, &c. (which must on no account become dented, or the dent is fatal to action)—and all such things (which he admits are a little more costly than the similar utensils at present used by the householder) he does not propose to supply to the estimable persons who confide their meals to the electric cooker. Thus here, again, we have an additional cost on the consumer. The moral and intellectual damages have not been taken into the account. These are avoided. Sufficient for the day are the cost of current, rental charges, increased cost of utensils, and wear and tear. Mr. Christie has managed to secure eleven hirers—probably chiefly from among his friends. Is this the "great success" that is referred to as having attended the recent cooking demonstrations? It is quite clear that the Electricity Committee of the Brighton Corporation should for their own edification, as well as for our interest, get Mr. Christie, who has the power of estimating cooking consumptions for households of six people, to exercise his precious faculty in reporting upon the approximate average cost (apart from the initial cost of the apparatus) of fixing up an electric cooking set, and as to a fair sum to calculate for wear and tear. The report should also embody an account of the Electrical Engineer's justification for charging only 1d. per unit for this short-hour intermittent use of electricity for culinary operations in the dwelling-houses of Brighton.

The discussion by the Institution of Electrical Engineers of the causes hampering the electricity industry in regard to the larger employment of electricity for domestic purposes, has ended; and nothing new has resulted. As we have said before, all the old causes that are considered blameworthy for impeding the electrical industry in taking possession of the whole of the heating business of the world have been trotted out during the debate, and the mellowed remedies have not been supplemented by anything new. As a materially effective conference, it must be sadly disappointing to the electrical industry. There was a touch of freshness about the remarks of Mr. H. H. Holmes, of Marylebone, in the course of the final discussion. Marylebone has gone farther along the road than probably any other local authority in trying to expedite the uses of electricity for purposes other than lighting. There was some plain truth in what Mr. Holmes had to say. Marylebone has set afloat more tariffs than probably any other single supply authority in the whole world; and therefore it must have been disconcerting to some of his hearers to learn that it is Mr. Holmes's deliberate opinion that no tariff has yet been devised which could enable the same wiring to be used for lighting as for other domestic purposes. So far in regard to tariffs. Then as to electric cooking. This is a subject on which a few bold declarations have from time to time emanated from Marylebone. But Mr. Holmes on this occasion was apparently talking with a due sense of responsibility; and he solemnly declared that there has been no invention during the past five years which has constituted an improvement on the electric-cooker. What do the manufacturers think of this allegation? Mr. Holmes went beyond this, and indicated what the Electricity Department of Marylebone thinks of the reliability of the apparatus that they put into consumers' houses. In their case, all the apparatus is inspected at least once a week by a responsible official of the Department; and thus defects in appliances are discovered of which the manufacturer is quite ignorant. It speaks highly of the undependable character of appliances that need such close care as a weekly inspection by a responsible expert. It would be an enormous staff that the Gaslight and Coke Company would have to keep if they undertook a weekly inspection of all their heating appliances; but fortunately such frequent inspection is not required in the case of the simple gas-stove. Among the remedies suggested by other speakers for boosting-up the use of electricity in the household were the introduction of electric-cookers into schools of cookery, hiring of apparatus, a common system of charge, standardization of voltages, and a policy of co-operation between all sections of the industry. No one let fall a word of sympathy for the poor unit struggling with adversity through its low heating power. Bearing on Mr. Holmes's statement as to a weekly inspection of electrical appliances being introduced at Marylebone, it is observed that "M.H.P.," writing in one of our electrical contemporaries, remarks that "municipal engineers have a duty to perform to their consumers more dignified and honourable than swamping them with electrical gewgaws and doubtful utilities with butterfly existence."

The National Electric Construction Company seem to have had a somewhat thorny and disappointing existence. As is perhaps remembered, the Company have at the present time a Bill in Parliament for the purpose of getting the Legislature to whitewash those local authorities who have been using the Company as a byway for evasion of the disability as to wiring that exists. The Bill, although it has been allocated to a Committee, has been blocked on second reading, because all the local authorities who have agreements with the Company are not desirous of being included in the Company's generous purpose, and for (a discussion in the Canterbury City Council suggests) a very obvious reason. The scheme of the Company is to supply electric wiring; the Corporation collect 1d. per unit consumed from the consumer for the wiring; and this 1d. per unit is handed over to the Company. We take it this is the general scheme. It transpires that at Canterbury there have been twenty-two consumers who have used wiring on these terms. But to-day the Town Clerk confesses that there are only two from whom the pennies could be collected if the pence were worth the trouble. In the case of some of the other consumers, "many wires" (to quote the Town Clerk) have been pulled out. This carries its own tale. There has been misapprehension all round over this business—misapprehension by Council, by Company, and by consumers. Some local authorities do not want to continue the agreements. But they were parties to them. Equity raises its voice, and says that something should be paid to the Company. The offers, however, are a comparatively few pounds; the Company's lost expenditure from the towns whence the offers emanate, hundreds of pounds. It seems to have been a miserable business and failure; but the Company have still their Bill asking Parliament to make legal the illegalities that have been committed.

The yellow flame arc lamp has been receiving the attention of Mr. M. Solomon in a paper before the Birmingham section of the Institution of Electrical Engineers. If a layman really wants to be guided on matters electrical, he hardly knows where to turn for good advice. If he goes to Mr. Solomon he will, exercising his reputed characteristic wisdom, tell him that there is nothing like the yellow flame arc. If the same layman goes to someone who is interested in metallic filament lamps, or the fittings or lanterns for such lamps, he will be told that all that is bad, and all that violates the principles of scientific illumination, are to be found in the yellow flame arc lamp. Contradictions are plentiful. Mr. Solomon speaks in somewhat lordly terms of his pet yellow flame lamp; his championship finding expression in the statement which has a bit of a classical ring about it. "It stands unchallenged as the most efficient form of artificial illuminant yet produced." Of course, Mr. Solomon was fully conscious that this was not quite correct; but it was a good attractive phrase. We find proof of his consciousness that there is another form of illumination which does challenge the flame arc lamp—and on other points additional to cost—and that is the high-pressure gas-lamp, because he speaks of the competition of the high-pressure gas-lamp as being "real," while talking about the competition of the high candle-power metallic filament lamps as being imagined. He thinks it a good thing that electrical engineers are paying more attention now to the cost per candle-power-hour than simply to carbon cost. Naturally those interested in arc lamp-making like to see energy sold at unremunerative rates, so as to reduce the total cost per candle-power-hour; those interested in electricity supply like to see the cost of carbons reduced, so as to contribute towards meeting the competition they are bound to meet from the high-pressure gas-lamp.

At last the Bill of the Incorporated Municipal Electrical Association has been exhumed, and has once more been introduced to the notice of the House of Commons as a measure worthy of all consideration. We have no doubt before it gets through the Houses it will receive all the attention it merits. It merits much; for a more extensive piece of impertinence than the Legislature, taking all its proposals together, has rarely, if ever, been asked to ratify. The Bill, we venture to predict, will never go through in its present form. It asks for too much; gives too much rope for speculation; and it has been cleverly drafted for the purpose of conferring powers that are shadowed out so faintly as to be almost imperceptible to anyone who has not followed closely the modern history of affairs electrical.

Some electricians are at their old game again—making comparisons of costs in various establishments, with, on the one side, modern electric lamps and, on the other, their predecessors old-fashioned gas-burners—giving no information as to hours of use, or whether the illumination is the equivalent of what can now be obtained with modern inverted gas-burners, which supply the user with the maximum of light just in the directions where it is required. The unfairness of these comparisons of the electricians is so conspicuous to technical lighting men, though perhaps not so apparent to laymen, that electricians ought to be thoroughly ashamed of making use of them. The electricians themselves know that, in respect of light distribution, unaided the inverted gas-burner is the superior of the metallic filament lamp; they know that 20 to 25 candle power can be developed with modern gas-burners per cubic foot of gas; they know that the efficiency of metallic filament lamps is nearer 1·5 watts per British candle power, than 1 watt (as shown again by Mr. Jacques Abady in the lecture published by us last week); they know, too, that the mantle consumption with inverted gas-burners is trifling compared with the old vertical burner; and they know the renewal costs of metallic filament lamps. Knowing all this, they publish contrasts showing a superiority in low cost by metallic filament lamps without explaining that the conditions do not represent modern gas lighting, and that in other respects the circumstances vitiate the results. Their action in this matter appears to us to be utterly mean, and does not evidence a single spark of the boasted British characteristic of fair play.

The London and Southern District Junior Gas Association, who were to have visited Margate last Saturday, decided not to do so, as the number who had promised to join the party was not sufficient to secure the anticipated reduction of fares. The outing will now take place in June or July. The Association will hold their annual general business meeting on the 24th inst., when Mr. J. G. Clark, the retiring President, will address the members on the work of the Association. The other business will include the consideration of suggested alterations in the rules.

THE RECENT ADVANCE IN THE PRICE OF GAS-STOVES.

THERE are two sides to every question; and it is only right—it is only British-like—to hear both sides before passing judgment. A question has arisen as to the justification or otherwise of the gas-stove manufacturers having made two successive advances in the price of their goods—the first, of 10 per cent.; and the second, of 5 per cent., or, in certain exceptional cases, 10 per cent. The correspondence that has been received by us complains of, and condemns, this action of the gas-stove makers; but it is not fair to allow condemnation to repose on any *ex parte* statement. Both parties to any issue should be permitted a hearing before judgment is passed; but we do recognize fully the extreme difficulty of the gas-stove firms, individually or even collectively under the names of a few representative firms, presenting a public reply in vindication of their action, as the very act of replying might by some of those with whom they do business be construed as evidence of open hostility. This being so, we have collected the points upon which the gas-stove makers justify the recent advances in the prices of their goods, and have put them into connected form as the sum-total of the accumulated views. We do not, however, desire that it shall be understood that this article binds every gas-stove maker to subscribe to the aggregate of opinion represented by it, although we believe that it may be taken to fairly comprehend their general views, and therefore the case for justification.

No brief is held by us for the gas-stove makers. Our position between the gas-supply industry and the manufacturers is one of strict neutrality, save when there is some happening where the weight of evidence is so absolutely on one side that, to go contrary to it, would be in opposition to the dictates of common sense. Here, however, we have seen; and we have investigated. As a result, it must be said that we are not convinced that it is just to condemn the makers for the advances that have been made in the unbending manner that has been done. This we say conscientiously. There is nothing within the range of our knowledge (and we think most reasonable men on consideration will assent to this) that suggests to us why the gas-stove makers should be immune from the inflictions and liabilities of contemporary movements. It is found that, in conformity with universal experience, higher labour charges and statutorily imposed responsibilities have not passed over them; it is found that strikes and increased costs external to their own industry have increased to them the prices of materials. We cannot conceive, with such comparative evidence and facts before us, why it should be expected that increased cost should not be covered by advanced charge—the same as in all other fields of industry and commerce. Just before sitting down to put together the results of the inquiries made, a cooking-stove has been under inspection which is built up of no less than eighty different parts, which weighs 170 lbs., and the price of which is only the equivalent of 2d. per lb., which as we have pointed out elsewhere compares unfavourably with some forms of crude foundry castings. Such evidence as this cannot be set aside as of no account.

The stove makers, we are positive, are fully as persuaded as the gas-supply industry of the mutuality of interests that exists between the two sections in the present, and more particularly prospectively. This has been amply attested by their actions in connection with the Society of British Gas Industries. Further testimony is found in this assurance that we have from them: *They are fully prepared to justify their recent action in advancing prices by laying, in confidence, the confirmatory evidence before a Joint Committee composed of leading members of the Institution of Gas Engineers and an equal number of representatives of their own section of the manufacturing industry*. Nothing, we think, could be fairer than this suggestion; and nothing, we think, could show in more definite form the feeling of reliance of the stove makers at being able to prove that there has been no attempt on their part to obtain undue financial advantage out of circumstances which are more than temporary or adventitious in kind, and from which they, in common with others engaged in manufacture and commerce, cannot escape. All reasonable men will see the strength in the situation that this offer discloses.

We will not discuss any of the other points; but will now assemble the views that are to hand, and present them—not as our own, but as those of the stove makers, to most of which views, we doubt not, all will be prepared to subscribe, but to a few of which individual firms may be prepared to give less weight than to others.

The Case of the Stove Makers Compiled from Various Views.

THE FIRST ADVANCE.

WE gather that the first of the advances of which complaint is now made was effected some twelve weeks ago—viz., on Feb. 16. Then no general exception was taken; it being well known and generally accepted that substantial increases had taken place in the cost of materials. As a matter of fact, this advance was not imposed, it is quite clear, until long after serious rises in the cost of material had occurred, and even now, it is submitted, the aggregate of these advances is inadequate to meet all the conditions. More on this point as we proceed. Under the circumstances, the first advance appears to have been conceded as legitimate; so this leaves the point as to the second increase.

THE SECOND ADVANCE.

It is not unnatural that the question should be asked, "If the stove-makers studied the prospects so as to fix the advance at a figure adequate to cover them, how could this second advance have become necessary?" The answer gathered is, that the first advance was made before the coal strike, and to meet increases in costs already for some time in existence; and that no man could have possibly anticipated the circumstances of the coal strike—its prolonged duration, and its disastrous consequences. There is no question that this occurrence in our national history has introduced an entirely new and unforeseen element into the situation, which was not, and could not be, provided for prospectively in the earlier advance.

It has, we find, been the general experience of the gas-stove makers that contracts entered into by them for the supply of material have proved, owing to the coal strike, entirely worthless, notwithstanding that the suppliers entered into the contracts in perfectly good faith. These contracts remain indefinitely suspended; and manufacturers are having to buy wherever they can, at whatever price they can, and always at prices greatly in excess of their contract prices, as they are only too glad to get material at any cost to keep their works going at all. For this greatly enhanced cost, the stove-makers have no remedy in the shape of a claim against the suppliers, because such contracts are invariably fenced with clauses excepting strikes, accidents, and similar occurrences.

NO MONOPOLY, AND UNSTABLE AND UNUSUAL CONDITIONS.

Gas-stove making is not a monopoly. The British section of the industry has to meet competition not only from outside itself, as in the case of the gas-making industry, but also (unlike the latter) from within. The competition is a daily growing one. Let us put the position in another way, as it was put to us. Gas undertakings can modify the price and conditions of their sale of gas and gas apparatus, so as to practically ensure themselves making a profit under all ordinary conditions; while the gas-stove makers' hopes of profit are the sport of a thousand varying conditions—including prices of material, vicissitudes of competition, and the naturally varying moods or fancies of gas managements in different towns.

Another respect in which the gas-stove maker is at a great disadvantage, as compared with a gas authority, it is submitted, is this: When a gas authority fixes the charge for gas at a given price per 1000 cubic feet, they know that for every 1000 cubic feet sold, they will collect this price. But when a gas-stove maker sells stoves to a gas authority at a given price, he knows that, through the (gas-stove makers may consider it an unfortunate) custom which has arisen, he will in many cases for that price have not only to supply the stoves, but set about disposing, or helping to dispose, of the stoves to the local gas consumers, which involves him in the cost of canvassers, exhibitions, and special advertising literature, apart from his own catalogues, &c. Viewed thus, in other words, he has, to all intents and purposes, to bear the cost of selling his goods twice—first to his customer, and then to his customer's customer. This is a state of matters which probably exists in no other industry in the world.

But this is not all. It is surprising to learn, and we do feel that it is a thing to be condemned as unfair trading practice, that, before a gas-stove maker can obtain an order, he is sometimes faced with the demand that he should buy back old stoves, whether of his own make or not (which have for years been earning a revenue for the gas suppliers), and that not at scrap price, but at a substantial figure, which frequently removes his profit.

CONFERENCES OF THE STOVE MAKERS.

In the stove-making industries, as in other industries, difficulties and problems are found to arise over which (apart from competitive and commercial practices) conference is considered useful and desirable. But these meetings have been referred to in uncomplimentary terms. In connection with this matter, it is pointed out by stove makers (and there is no strong answer to their submission) that gas managers in the various districts meet periodically as Commercial Sections of the District Gas Associations for comparing notes upon their common interests as purchasers of

various materials. Of this, no one stove maker complains. "But why," they ask, "should we be accused of conspiracy if we do the same thing?"

Makers' Increased Costs.

The gas-stove makers' cost books of a year ago and those of the present day disclose a very interesting comparison. It is found that the cost of many of the popular selling stoves to-day, including the total present advances, is such that, at the regular selling price, a number of these stoves are sold without profit to the makers. This may be said to be their own fault. But it is a condition of things that has grown, it is evident, through the pressure of commercial rivalry, and the desire to have lines that have an advertising value and a business-opening capability. These lines have, however, grown in popularity, until they represent a substantial proposition in the total business.

Then as to material. Cast-iron costs to-day, owing largely to the coal strike, considerably more than it did. Brass, enamel, tinware, &c., have all increased in cost during recent times by very substantial percentages.

Labour costs are also higher; and labour has introduced new financial obligations. These are points that need not be laboured, for they must be apparent to all.

Lower Selling Prices.

Selling prices in the gas-stove trade are much lower to-day in comparison with what they were a few years ago. It is not that in every case the prices have been lowered, or the discounts always increased, but that (the information is clear) in various classes of goods the more expensive types have been superseded by a lower-priced type. In other cases, the list price and discounts have been entirely lost sight of; and a series of acutely and unprofitably "cut" net prices have taken their place.

Improvement Costs.

Strongly impressed upon us is another point. Simultaneously with the reduction in the gas-stove makers' selling prices occasioned by these changes, there has grown up a steady increase in costs owing to the rapid process of improvement that has been effected in the goods themselves. It is only necessary to compare the patterns of a few years ago with those of to-day in order to see that, in design, in numerous technical improvements, and in quality of finish, there has been a vast change; and the most modern and progressive methods have been initiated.

Take one case as an illustration of this. The type of gas-fire which was supreme six or seven years ago, with its elaborate internal arrangements, its complicated construction, and its consequently substantial price, remains in makers' catalogues to-day unaltered in price. But it has become obsolete, and has been replaced by the modern gas-fire built upon totally different lines, requiring for its construction an exactitude neither asked for nor found in the older type; and yet this modern fire, with its greatly increased efficiency, is being sold at prices so low as to bear no comparison with those of the older type.

Less than it Seems.

In this connection, therefore, it may be well to remind ourselves that, when the price of an article is cut down so low as that of most modern gas-stoves, an advance, even if it be nominally of a substantial percentage, is actually a very much smaller affair than it sounds. If one is buying a stove at 20s., even a 20 per cent. advance on that figure is only 4s.

Twopence, and Less, per Pound.

Reference has just been made to recent years' improvements in the quality and finish of gas-stoves. It is pointed out to us that it is apt to be forgotten that, in this respect, gas-stoves have for long maintained a much higher standard than that of the ordinary iron-foundry trade, so that gas-stoves must not be thought of in the matter of price as though they were merely so many iron castings. Notwithstanding this, however, such is the "cut" nature of gas-stove prices to-day that their price per pound actually compares unfavourably with that of ordinary foundry castings—the slot gas-cooker, for example, working out, complete, with its brass taps, enamelled door, oven fittings and tinware, in one case at 1¾d. per lb., and in another at 2d. The latter example we have investigated, and find the statement true. It is the one referred to in our introductory remarks.

Makers' Large Stocks.

Presented as yet another condition of their business which is greatly to the disadvantage of the gas-stove makers is this: A very large number of gas-supply authorities make a practice of ordering in advance as little as possible, and restricting their stocks to the lowest figure—a practice which necessitates the makers holding enormous stocks, in order to be in a position to promptly fulfil large orders at a moment's notice, when, owing to weather or other conditions, a considerable demand suddenly arises. This necessity for holding stocks is complicated by the further fact that, in a number of instances, particular gas undertakings have special requirements of their own in regard to apparatus, necessitating stock being kept of either entire stoves, or certain parts embodying the special variation which the individual undertaking requires. Thus a gas-stove maker may have to keep not one stock of a particular stove, but several distinct stocks. The ways in which this practice adversely affects the gas-stove maker, it is pointed out to us, are two: In the first place, he has to sink a considerable amount of money in these stocks without knowing when he may be able to realize; and, in the second place, the gas authority in such cases undertake no obligation whatever that, in the event of an entire cessation of orders, owing to the public demand shifting to some other class of goods, they will take any of these stoves off the makers' hands. Cases, we are told, have occurred from time to time where a very substantial loss has arisen in this way through a maker having to scrap a substantial stock which he had laid in—not through any imprudence of his own, of which he would naturally have to bear the consequences, but through being absolutely bound (in order to retain the business with the particular undertaking) to keep up a large stock against a possible demand which he had no first-hand means whatever of estimating.

Costs in Effecting Efficiency Improvements.

There is yet another factor in the situation, upon which we ourselves wish to place full weight, and which no one desiring to justly estimate the situation can ignore. During the last few years gas-stove makers have been making unparalleled efforts in experimenting, and have incurred heavy costs in patterns and research work, to improve the quality, utility, and hygienic value of their apparatus; and by this means they have furnished gas undertakings with types of apparatus fitted to commend gas to the public on a scale hitherto unattained, so putting into the hands of the undertakings, without the call for any preliminary outlay or enterprise on their part, a means which has proved itself most effective in increasing gas sales. In these circumstances, it may well be said that gas sales would have been in a very much poorer position to-day had it not been for the enterprise, energy, and skill on the part of gas-stove makers, which has brought about so great a change in the uses of gas to-day and its prospective uses to-morrow.

No work of this kind such as has been done by the gas-stove makers can be accomplished without substantial outlay; and yet the prices of nearly all gas-stoves and gas-fires (advance included) are demonstrably much lower to-day than they were a few years ago. It is suggested that, in face of all this, the last thing the gas industry would wish to do would be to say, "Thank you for nothing," and to still depress prices and harden terms.

It is apparent that the unfortunate conditions and grievances under which gas-stove makers have to labour must form a clog upon their efforts towards continued improvement of gas-stove apparatus in the interests not only of their section of the industry, but of the industry as a whole.

Unfair One-Sided Contracts.

Yet another point upon which information points to a further grievance is this. It is the practice by which, in some cases (we are glad to learn not in all), contracts entered into by gas suppliers for the purchase of gas-stoves are, in practice, only binding upon one of the contracting parties—the gas-stove maker. The gas suppliers concerned claim the right of purchase from competitive firms, notwithstanding the contract. Then if prices fall during the period of contract, they claim the benefit of the reduction; but if prices rise, no claim by the stove maker for the benefit of the increase is entertained. If a contract is fixed up while an advance is in operation, it appears that it is frequently the endeavour of the gas authority to compel the stove maker, under pain of forfeiting the business, to allow the contract to be fixed without the inclusion of the advance. When a contract is made during the time that an advance is in force, the gas management sometimes insists on a clause providing that, when the advance ceases generally, it shall disappear from invoices under the contract; or, in the absence of such a clause, they simply deduct the advance when it ceases to be generally in force, and meet objections by open threat of closing the account. On the other hand, however, if after a contract is made, an advance takes place, the stove maker is on no account allowed to add the advance to the contract price, and when a contract is nearing its close, if an advance has meantime taken place, the gas authority frequently insists on the stove maker accepting such a large order at contract price as would meet his requirements for a considerable time beyond the period of the contract. When a contract expires, the price having in the meantime risen, gas suppliers frequently claim the right to renew the contract at the old price; and if the stove maker does not consent to this, but invoices at the advance, the advance is deducted. On the other hand, when the converse case arises—viz., the fall of the price—they will not listen to the suggestion of renewing at the higher (that is, the contract) rate. When an advance takes place, the claim is suddenly put forward by gas authorities that they have a contract, although none of the essentials legally constituting a contract are in existence—there is nothing in writing, there is no period fixed, there is no quantity fixed. If the stove maker were, in the event of a fall in prices, to suddenly claim the existence of a contract on no more tangible basis, no gas authority would be willing to hear of the suggestion for a moment. But if the gas-stove maker does not agree to the existence of a contract when the advance takes place, he is immediately faced with threats that he will lose his entire business in the particular town.

As we have said, we are glad that these conditions do not apply generally. Such one-sided contracts are distinctly unfair, and are to be deprecated.

Profits and Dividends.

This question remains to be dealt with. The point may not unfairly be put: "Seeing gas-stove makers are said to be suffering

under so many conditions unfavourable to profit-earning, how do they stand year by year in the matter of dividends?" The answer we gather is that two or three of the gas-stove firms have still managed to do well for their shareholders, but in each case these are firms who carry on other substantial sections of business besides their ordinary gas-stove trade. As for the remaining stove makers, their position during recent years has been one of steadily falling dividends, and in some cases no dividends at all. It is only necessary to refer to the balance-sheets of the various makers to find ample confirmation of this unfortunate state of things.

UNANIMITY.

A suggestion has been made that there were divided counsels among the gas-stove makers as regards the putting on of the advance; a minority being opposed to this, but were overborne by the others. We are assured that, as a matter of fact, the whole of the gas-stove makers were equally unanimous in feeling the necessity for the advance, and entire agreement was instant and unanimous.

CONCLUSION.

This information as to conditions we think will stem the spread of dissatisfaction over the recent advances—more especially in view of the suggestion made in the opening lines as to a confidential investigation by a Joint Committee.

One cannot but feel that there is great reason to hope that the various opportunities provided by recent organizations for friendly intercourse and exchange of view between the gas-manufacturing industry and that of gas-apparatus making, will so continue to rapidly enable each side to grasp and sympathize with the difficulties and problems the other has to face, that before very long complaints and misunderstandings, such as those arising out of the present advances in gas-stove prices, will become things of the past.

INSTITUTION OF WATER ENGINEERS.

Programme of the Summer Meeting.

WE learn from the Secretary (Mr. Percy Griffith) that the seventeenth summer general meeting of the Institution will be held at Cheltenham from the 6th to the 8th prox., under the presidency of Mr. J. S. Pickering, M.Inst.C.E., the Borough Surveyor and Municipal Water Engineer. By permission of the Mayor and Corporation, the meetings will be held in the Town Hall; and at the opening of the proceedings the members will be welcomed by his Worship, Councillor C. H. Margratt, J.P. Ladies will be cordially welcomed at the meetings and visits; and the hope is expressed that a large number will be present. The programme will include the presentation of premiums awarded by the Council for papers contributed during the year 1911, as well as other business of special interest to members, so that a good attendance is confidently anticipated. The following papers have been promised for reading and discussion:—

"The New Water-Works for Skegness," by Mr. Percy Griffith, M.Inst.C.E. (held over from the last winter meeting).

"Rating of Water Undertakings," by Mr. Donald Dinwiddy, F.S.I.

"Rating of Water Undertakings," by Mr. Arthur Valon, Assoc.M. Inst.C.E.

[The two last named papers will be discussed together.]

"The Hinckley Water-Works," by Mr. E. H. Crump, Assoc.M. Inst.C.E.

"The Gloucester Water-Works (Witcombe Reservoirs)," by Mr. R. Read, Assoc.M.Inst.C.E., City Engineer of Gloucester.

"Use of Sulphate of Copper in Purifying Water Supplies," by Mr. Geo. Embrey, County Analyst of Gloucestershire.

"Self-Pollution of Water by Natural Growths," by Dr. J. H. Garrett, Medical Officer of Health for Cheltenham.

"The Geology of Cheltenham, with Special Reference to the Water Supply," by Mr. L. Richardson, F.R.S.Ed., F.G.S.

There will be a discussion upon the desirability of standardizing the general conditions of contracts, which will be introduced by Mr. Harold W. Woodall, M.Inst.C.E., Engineer and General Manager of the Bournemouth Gas and Water Company.

The President will deliver his Inaugural Address on the opening day of the meeting, and will also supply a description of the Cheltenham Water-Works. Dr. Samuel Rideal will furnish a few descriptive notes on the pre-filtration process now being introduced at the Tewkesbury works of the Corporation.

The afternoons will be devoted to visits. On Thursday, one will be made to the Tewkesbury works, including the pumping-station, the new pre-filtration plant, &c. On Friday, the members will inspect the Dowdeswell reservoir and filters, and also the Hewletts reservoirs of the Corporation. On Saturday, there will be a visit to the Witcombe impounding reservoirs and filtration works of the Gloucester Corporation.

Social functions will, as usual, be interesting features of the meeting. The annual dinner will be held at the Town Hall on Friday evening, June 7, when the Mayor of Cheltenham and other distinguished guests of the Institution will be present. On Thursday evening, the members and their friends are invited by the Town Improvement Committee to attend at the Montpellier Gardens, where a concert will be given by the Munster Fusiliers. On Friday afternoon, the Mayor will give a garden party in Pittville Park from five to six o'clock.

THE COMFORT OF THE VISITOR.

The "Taxi-Meter" Gas-Fire for Hotels, Clubs, Pensions, &c.

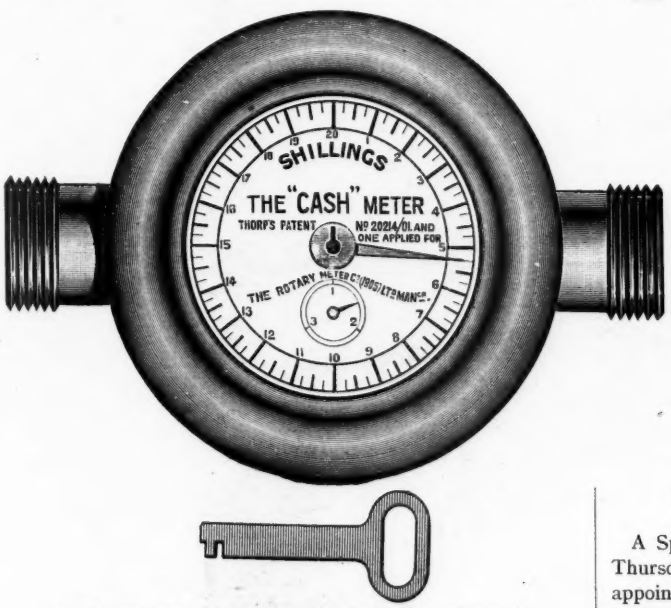
THE season for inland and seaside health resorts is approaching, and preparations are being made with all speed for the entertainment, both indoors and outdoors, of the visitors. But some of the leading spirits at certain of our great coast resorts are bemoaning what is a fact—that the seasons are all too short for them. There is Folkestone, for example. On Thursday last, an article in the "Standard" informed the reader of a natural deep-rooted desire on the part of the local authorities to prolong the season there, and so increase the prosperity of the town. Folkestone has many natural attractions; but a matter of ten weeks or so see the beginning and end of the season. This it is desired to alter; and consideration is now being given to various enterprising schemes. There is, however, another matter that troubles Folkestone. Its harbour-pier, as the article in our morning contemporary puts it, is one of the great gates to the Continent. It is in touch with Rouen, Lisieux, Caen, Bayeux; it is the highway to Paris, Geneva, and Rome; and it has a service five hours from Flushing. People from the Continental countries—from as far afield as Russia—pass through the town; and Americans visiting the Continent flow through it from London. Folkestone would like these wealthy visitors to tarry a bit. But they simply flit through the place; and these rich sources of revenue are closed to the town. It is not that Folkestone cannot offer hotels and pensions of the highest class. It can. But perhaps even these places of luxury and refinement could be improved in some respect, and made more attractive, and suitable for people who like the comforts of home away from home.

Folkestone has been the illustration so far. What we have to say now applies to all inland and coast health and holiday resorts; and the argument must appeal to all enterprising proprietors of hotels and pensions. If it is desired to prolong seasons, the seasons must extend into those parts of the year when mornings and evenings become chilly; and when ever-ready fires in bed and private sitting rooms are welcome contributors to comfort. The Britisher has his gas-fire at home in his bed-room; the American has his central heating; visitors from Germany and from Russia, their enclosed slow-combustion stoves. The latter are accustomed, as soon as the atmosphere becomes chilly, to occupy rooms that are kept constantly warm. All, on their travels, like the convenience and comfort of a fire, if it can be obtained without trouble, and without the asking of a special favour. There is now an attractive means available for giving them what they desire. Gas authorities in all these health resorts—inland or coast—participate in the prosperity of the seasons; and the longer the prosperity endures each season, the better for them. The gas authorities are therefore the people to introduce to the proprietors of hotels and pensions the means by which additional comfort can be obtained in the bed and private sitting rooms occupied by visitors. A difficulty in the use by visitors of gas-fires in their rooms has been the non-existence of a proper check on the heating accommodation thus provided, and of a base upon which a charge could be made that was not likely to give rise to prolific trouble between proprietor and visitors. The gas-fire gives the visitor the opportunity of securing additional warmth instantly, when he or she pleases, and just to the degree that accords with personal notions of comfort. But there was that one difficulty—the absence of an arbiter of proper payment over which there could be no dispute.

The deficiency has been met, and in a way that is most ingenious, and a way that we have every confidence in saying will become highly popular. To Mr. Thomas G. Marsh and Mr. F. Thorp (associated in the Rotary Meter Company, Limited, of 28, Deansgate, Manchester) the gas industry is indebted for several original appliances and ideas; to them the gas industry and the proprietors of places that give habitation to paying visitors at night time owe the "Taxi-Meter" for application to gas-fires. Everybody knows now what the taxi-meter means in connection with road locomotion. Everybody knows who rides in a taxi-cab that the amount he has to pay is registered on the taxi-meter, and that the driver cannot demand a penny more, nor can the user of the cab demand that the driver shall take a penny less. There is no room for quarrelling or dispute. The same with the gas-fire, fitted with the "Taxi-Meter." The visitor lights the fire without asking leave of the proprietor of the hotel, club, or pension; without calling in the aid of any of the servants; without having to trouble for the coal-scuttle to be replenished. No preparation is required; no favour is asked; no personal service is rendered. The "Taxi-Meter" keeps the record as to the use of the fire, and tells the user exactly what he has to pay, and the proprietor of the establishment precisely what is due from his guest. The day will come when the visitor to hotels will want to know why (if there is not one) a "Taxi-Meter" gas-fire is not in the bed room; the day will come when the visitor will order a bedroom to be reserved for him that has a "Taxi-Meter" gas-fire fitted in it. There is new business in this, not only for gas undertakings and hotel and boarding-house proprietors in all health and holiday resorts that desire to extend their seasons, but for gas supply undertakings in every city, town, and village where there is an hotel. And every gas administration in the country is interested in every other gas administration pushing "Taxi-Meter" gas-fires in all hotels and boarding-houses, on account of their advertising the special virtues

of the convenience and comfort of gas-fires among people staying away from home.

The "Taxi-Meter" does not entail any additional work on the gas suppliers. The gas used, so far as they are concerned, is charged for through the ordinary meter on the premises; and the gas is paid for by the proprietor according to the registration of that meter. The "Taxi-Meter" is entirely a matter between the proprietor and his guest. For the convenience the proprietor affords, he has a right to some profit; it is his business to make a profit out of the accommodation of any sort with which he supplies his visitors. He makes a profit from solid-fuel fires; he has a right to do so out of gaseous-fuel fires. Therefore, a dial is affixed to the "Taxi-Meter" which will supply him with a margin of profit on the gas used. Travellers always expect to pay more away from home than they do at home; and the margin could well be at a point sufficient to pay the gas undertaking a sum for the hire of the fire and the "Taxi-Meter," and still leave a profit for the proprietor of the place. The dials are marked (and are interchangeable) so that whatever price the proprietor determines to charge for the gas used, he can have the correct dial for it; if he determines to alter the price he charges, it simply means having the dials changed for the one corresponding to that price. There is no difficulty about doing this. Then when the charge is made in the account of the guest, after a night, week, or whatever period the room is occupied, or the period for which the account is rendered, the key supplied with the meter, and retained in the proprietor's possession, is put into the lock, and the pointer is turned back to zero. The fire is then ready for a new account,



The New Gas-Fire "Taxi-Meter" and Key (shown full size).

or a new visitor. The construction of the "Taxi-Meter" is such that—this is a consideration—the key will not turn the pointer against the guest; the only way of moving the pointer forward is by passing gas through the meter to the fire.

Here, then, we have a means by which hotels and boarding-houses can enhance the comfort of their bedrooms, and so in one way assist in promoting the attractions that are necessary to the prolongation of seasons at health and holiday resorts; hotel proprietors everywhere have also here a means of adding to the comfort of their bed and private sitting rooms; and here, too, gas companies have a means not only of extending their business, but of silently advertising, without cost or effort but with profit, gas heating for domestic purposes. The gas-fire "Taxi-Meter" has come to stay, and to be "a boon and a blessing" to men, women, and children, when on their travels.

Physical Method of Gas Analysis.—Professor Sir J. J. Thomson, of Cambridge, upon whom has lately been conferred the Order of Merit, in place of the late Lord Lister, has introduced a remarkable physical method of analyzing gases. According to the "Chemical Trade Journal," he uses only traces of the gases in a vacuum tube, through which he conducts a specialized electrical discharge, exposed to a magetic field directed across it. The rays are deflected to an extent which depends upon the nature of the gas—more particularly upon its atomic weight; and the amount of deviation may be recorded by photographic methods. If the gas contains several constituents, each of these will be represented in the resultant photograph by its own image of impression, for to each gas present there corresponds a different deviation of the rays—thus forming a kind of spectrum. Marsh gas treated in this way is stated to yield curious results. Its photographic spectrum presents patches at points corresponding not only to a molecular weight 16 (that of CH_4), but also to 12, 13, 14, and 15, which correspond to carbon vapour and the otherwise unknown compounds CH_1, CH_2, and CH_3.

NATIONAL PHYSICAL LABORATORY.

Collected Researches.

The eighth volume of collected researches of the National Physical Laboratory, which has just been issued, contains reprints of eleven papers which have already been published elsewhere, and one original paper which gives an account of the Blythswood dividing engine for ruling defraction gratings.

The paper of most direct interest to gas engineers is one by Dr. J. A. Harker and Mr. W. F. Higgins on the "Methods and Apparatus used in Petroleum Testing." This paper was published in the "Petroleum World" in the autumn of last year; but it may be worth while reminding readers of the "JOURNAL" that the work recorded in it consisted mainly in a comparison of three types of flash-point testing apparatus—viz., the English standard (*i.e.*, the Abel apparatus), the German standard (*i.e.*, the Abel-Pensky apparatus), and the modification of the latter which has been adopted by some British colonies, which is spoken of as the Colonial Abel-Pensky apparatus. The average values of the differences between the flash-point as obtained in the different types of apparatus for oils flashing between 73° and 100° Fahr., show that the colonial type of Abel-Pensky apparatus reads 1·1° Fahr. higher than the Abel, and the German type of Abel-Pensky apparatus 3·7° Fahr. higher than the Abel. The causes of the differences in the results are discussed at length.

The other papers comprised in the volume include one by Dr. T. Stanton on the "Mechanical Viscosity of Fluids." In this paper, experiments are described on the relation between shearing stress and rate of distortion in fluids which are in eddying or sinuous motion—*e.g.*, air or gas passing through a pipe with a roughened interior surface. Air was the fluid chosen for the investigation, and comparative experiments were made on artificially roughened pipes and on smooth pipes of the same diameters. The conclusion drawn from the investigations is that the general character of the flow of air in pipes consists of a central region in which the ratio of the shearing stress to the rate of change of distortion is constant for any particular value of the flow, and that in the neighbourhood of the walls this alters rapidly until it becomes equal to the physical viscosity at the boundary.

The volume also contains an interesting paper by Mr. A. Blackie, on the "Behaviour of Fused Silica at High Temperatures." It is shown that, as far as the coefficient of expansion is concerned, the differences between the opaque and transparent varieties of fused silica are, for practical purposes, negligible.

MIDLAND JUNIOR GAS ASSOCIATION.

A Special General Meeting of the Association was held last Thursday at the Birmingham Municipal Technical School to appoint officers for the ensuing session and to consider various suggested alterations of the rules. There were comparatively few members present, and very little discussion took place.

The PRESIDENT (Mr. R. J. Rogers) informed the meeting that the Council had elected Mr. F. J. Ward, of Knowle, as Junior Vice-President, an announcement received with applause.

The Hon. Secretary, Treasurer, and Auditor were re-elected; the officers and Council for next session consisting of—

President.—Mr. F. Shewring, of Droitwich.
Senior Vice-President.—Mr. W. H. Johns, of Saltley.
Junior Vice-President.—Mr. F. J. Ward, of Knowle.
Hon. Treasurer.—Mr. G. C. Pearson, of the Birmingham Test Plant.
Hon. Secretary.—Mr. W. J. Pickering, of the Windsor Street Gas-Works.
Council.—The above-named officers, and Messrs. P. C. Balcon (Birmingham), B. J. Bell (Birmingham), A. Hancox (Malvern), T. H. Poulson (Cannock), and B. Skidmore (Smethwick), together with the President and Hon. Secretary of the Midland Association of Gas Managers.

The PRESIDENT briefly explained the suggested alterations of the rules of the Association; and they were approved *en bloc*.

Many of the amendments were of a minor nature, tending to strengthen or else elucidate the existing rules. Having regard to the disastrous effect on last year's balance-sheet, it was decided that the free distribution of the "Transactions" of the Association should be discontinued.

The PRESIDENT mentioned that the Council had appointed Mr. Pickering and himself to represent the Association at the Joint Council Meeting of the English Junior Gas Associations, to be held in Sheffield on the 18th inst. It was also stated that it had been found impossible to arrange the summer excursion which was included in the current programme; but it is proposed to hold a social function of some kind, in the form of a dinner or *soirée*, near the commencement of next session's programme.

A vote of thanks to the Hon. Auditor, proposed by Mr. W. J. PICKERING, and seconded by Mr. W. H. JOHNS, concluded the proceedings.

GAS DISPLAYS AT CARDIFF.

Some Notes of a Visit.

In the course of a notice which appears in another column of the regretted death of Dr. William Taylor, the Chairman of the Cardiff Gas Company, it is stated that a somewhat extensive scheme of high-pressure lighting has lately been inaugurated in the city. This was a progressive move which, Mr. George Clarry (the General Manager and Secretary of the Company) says, met with instantaneous success. Though the system has only been in operation during the last six months, there are already fixed 250 outside lamps, ranging from 500 to 4500 candle power. In addition to this, the Park Hall (the premier hall in South Wales) and the large Drill Hall are lighted internally with high-pressure lamps; and the installations have given the greatest satisfaction. About three miles of 12 to 4 inch high-pressure mains have been laid; and these traverse the whole of the business portion of the city—offering advantages in the way of illumination which have quite stirred up the Electrical Department. In fact, the whole of the high-pressure work done (which has included the displacement of forty arc lamps within the last two months) has been carried out in face of the keenest possible competition from electricity. From personal observation, the writer is able to bear testimony to the excellence of these gas installations, which have been adopted by shops retailing various kinds of goods—from cakes to jewellery—and seem to be equally suited for the advantageous display of all. Outside the extensive new show-rooms in Queen Street, there is a particularly striking line of eight high-pressure lamps, giving a light of 12,000 candles, which proves an effective advertisement for the system. The pressure-raising plant is situated in the Bute Terrace storage station, where, in the old exhauster-house, there have been installed two Keith-Blackman compressors (one of which is used as a stand-by), each capable of pumping 40,000 cubic feet of gas per hour into the city at a pressure of 80 inches. The gas is drawn from a small holder at Bute Terrace, which is fed from the Grangetown works. A feature of the compressor-house is the ready accessibility of the mains.

The Company experienced an unusually large increase in the consumption of gas last year; and in view of the fact that the price of gas for power purposes has lately been reduced to 2s. per 1000 cubic feet, there is good reason for anticipating that the present twelve months will again furnish a record in this respect. By making timely provision in the matter of coal supplies, the Company were able to get through the whole of the period of the late coal strike without in any way curtailing the gas supply to a single consumer. More than this, the whole of the anxious time of strenuous working was got through without a single complaint being received. There was not even a naphthalene complaint—a fact which may be attributed to the introduction at Grangetown of an apparatus to deal with this bugbear, designed by Mr. H. D. Madden, the Company's Engineer.

The Queen Street show-room (which includes a lecture-theatre,

CARDIFF GAS COMPANY'S STAND—THE MODEL KITCHEN.

where demonstrations are given two or three times a week) constitutes a permanent gas exhibition on a considerable scale, and proves to be a successful "business getter"—and not, it may be imagined, for the Cardiff Gas Company alone. There is extensive window space; and inside there are a large number of modern fittings and fires (as well as hot-water supply apparatus) connected up, so that intending purchasers may judge of their effect in actual use. At the present moment, however, the Company are engaged in still further demonstrating the advantages of the commodity which they have for disposal. This is in the form of a display at a popular exhibition, where there are provided attractions, including the band of the Scots Guards, which are calculated to appeal strongly to the general public. The title of this show, which is being held in the Westgate Street skating rink, is certainly a fairly comprehensive one—"Everything for the Home and Welsh Industries Exhibition"—and may be properly taken to include a selection of domestic gas appliances. The Company's stand (of which Mr. H. H. Langford, the Outdoor Superintendent to the Gas Company, has charge) is divided into two parts; one side representing a model kitchen, and the other consisting of a very well-arranged assortment of gas lighting and heating specialities. A Wright's "Empire" cooker and "King Alfred" baking plate are to be seen on the former side, together with a Wilson circulator fitted with thermostatic control; while the general utility goods in the other portion are far too numerous for individual mention. The wide selection of beaded shades, however, at once appeals to the eye; and other interesting items are a circulator with a tank fitted with a glass side, so that the circulation of the water may be followed, and meters showing the actual consumption of gas in incandescent burners. A local invention is the "Cytherma" apparatus, for providing hot water in houses fitted with circulating systems. It is really a double row of atmospheric gas-jets specially designed for insertion in the tunnel of a boiler such as is fitted to a kitchen coal-range. The gas connection is provided by means of a flexible tube; and arrangements are made for ensuring perfect combustion of the mixture of gas and air, and consequent high efficiency. Gas ironing and cooking demonstrations are given daily—the latter by Miss Jennie Barker, who shows the Cardiff housewives how to cook a complete dinner in an hour, with a consumption of 34 cubic feet of gas; the meal consisting of soup, fish, sauces, joint, three vegetables, two sweets, and a savoury.

There are some points which may be noted about the lighting in connection with the exhibition. A large stage at one end of the hall, on which the cookery demonstrations take place, as well as, at intervals, displays of the latest fashions in dress, is lighted by four 1000-candle Keith high-pressure lights, in connection with a Sugg hot-air engine; while there is a row of upright incandescent

CARDIFF GAS COMPANY'S STAND—GENERAL APPLIANCE DISPLAY.

burners acting as footlights—these being found extremely effective for showing off the dresses. The extensive demands of the band-stand in the matter of lighting have been fully met by the provision of four two-light and one three-light Podmore low-pressure high-power inverted lamps; and in connection with the entrance to the exhibition there is a gas-engine by means of which six 1500-candle and four 500-candle Keith high-pressure lamps are provided. This installation of power on the spot is necessitated, of course, by the fact that the Company's high-pressure gas-main does not run past the building.

COKE-OVEN BYE-PRODUCTS AND BLAST-FURNACE GASES.

In the course of his Inaugural Address at the Spring Meeting of the Iron and Steel Institute last Thursday, the President (Mr. Arthur Cooper) drew attention to some of the improvements which have taken place of late years in methods and plant which have placed the iron and steel industry in the position it now occupies. The following are extracts from this portion of the address.

Bye-Product Coke-Ovens.

Bye-product coke as originally made in this country had a very uphill fight, chiefly because it was much softer than the excellent beehive coke then in use. Its density of late years has been much improved by building the ovens of a width most suitable for the coals and by varying the time of coking; and coke makers who have had a lengthened experience maintain that by stamping the coal into a cake or block just large enough to fill the oven when pushed in, coke equal to that from beehive ovens can be produced from equal coals; that charging in a cake or block can be effected more expeditiously than by tipping the coal into the oven from the top and afterwards levelling it; that there is less loss of heat; and that there is a greater output per oven.

The ovens as originally built provided a small surplus of heat and gas for purposes outside the requirements of the plant; but the modern regenerative ovens with their economical methods of regulating combustion of the gas in flues, so as to obtain a perfectly uniform heating of the walls, provide a surplus of fully 50 per cent. of the gas produced for outside uses, such as for furnace heating, for lighting, or for power. This from a plant making 5000 tons of coke per week would mean upwards of 200,000 cubic feet of spare gas per hour—equivalent to (say) 8000 I.H.P. if used in gas-engines, or to about 750 tons of coal per week if used for metallurgical or heating purposes. Great improvements have also been made in the processes for the recovery of the tar and ammonia, giving better yields of bye-products, and reducing the cost of working expenses and repairs.

Blast-Furnaces.

Probably one of the most important developments in connection with blast-furnaces has been the cleansing of the whole of the gases; for, not only has it been proved absolutely necessary to use perfectly clean gas in the gas-engine, but it has been found very advantageous to rough-clean also that used for stoves and boilers, as with such gas the necessity for laying-off the stoves to remove the dust, with the consequent costly repairs, and the periodical stopping of the entire plant for clearing the dust from the flues, can be avoided. Further, by the use of a clean gas, the heats can be maintained in the stoves at a higher and more uniform temperature, reducing the consumption of coke; and since the cleaned gas has a higher calorific value, less is required, so that more is available for outside purposes.

It is claimed for the modern gas-engine, adopted almost exclusively in Germany, France, Belgium, to a considerable extent in recent installations in the United States, and in several large works in this country and in Canada, that it can be operated with about 100 cubic feet of blast-furnace washed gas per effective horse power per hour; and now that the weaknesses in design and construction—features of the earlier models—have been remedied, it is to-day a perfect machine, and quite as reliable as its predecessor, the reciprocating steam-engine.

At collieries and at blast-furnaces, where there are no iron or steel works depending upon heat, the surplus coke-oven gas is now frequently used for generating electricity for power and for light; and any such power and light beyond the actual requirements of the plant is sold outside—thus reducing the coal or pig-iron cost. It appears to be the general practice on the Continent, and in the new installations in America and in Canada, where steel-works form part of the plant, to use the coke-oven gases for metallurgical and for heating purposes, and the blast-furnace gases for the generation of power. Yet there are many instances where blast-furnace gases are also used in mixers, open-hearth furnaces, and heating furnaces, with satisfactory results.

The President of the Dutch Association of Gas Managers for the current year is Heer O. S. Knottnerus, of Rotterdam, and the Secretary is Heer N. W. van Doesburgh, of Leiden.

It has now been definitely arranged that Professor Arthur Smithells, of the Leeds University, will give the first of the "William Young Memorial Lectures" at the next annual meeting of the North British Association of Gas Managers to be held in Aberdeen in September. Professor Smithells will take for his subject the generation of light from gas, and proposes to deal in a general way with the guidance which scientific principles afford as to what may or may not be practicable in the future.

SURFACE COMBUSTION AND ITS INDUSTRIAL APPLICATIONS.

Lecture by Professor W. A. Bone, F.R.S.

The large Examination Hall of the Leeds University was crowded, on the occasion of the Annual Lecture of the University Cavendish Society on the 7th inst., to hear Professor Bone discourse on his further applications of surface combustion. As Leeds has been the scene of the working-out of its commercial applications, and as this was the first public occasion on which Professor Bone had thus taken his fellow-townsmen into his confidence, the audience was a very varied one. University students and professors mingled with representatives of the engineering and metallurgical industries, chemists and engineers had assembled from all parts of the country, and the gas industry was well represented—the President of the Institution of Gas Engineers (Mr. R. G. Shadbolt) heading the contingent.

Professor A. G. Green, Chief of the University Dyeing Department, occupied the chair; and, in introducing Professor Bone, reminded the audience that during the past thirteen months he had lectured on this subject at the Royal Institution, to the Institution of Gas Engineers at Glasgow, to the American Gas Institute and other societies in the United States, and that the German Chemical Society recently invited him to deal with the question at the Hoffmann House, Berlin—the lecture to be given as one of the two annual discourses delivered in commemoration of the great chemist Hoffmann.

Theoretical Aspects of the Subject.

In his introductory remarks, Professor Bone said he should direct the attention of the audience to the economic applications and commercial possibilities of surface combustion rather than deal in any detailed or argumentative fashion with its nature and character. It has long been recognized that metals of the platinum group have the power of inducing gaseous combustion (more particularly in the case of hydrogen), and of being able to do so at comparatively low temperatures. Sir Humphrey Davy first established the fact in 1816, during his classical researches upon flame. Dulong and Thénard developed the investigation, and proved that all solid bodies possess the power of accelerating combustion below ignition-point, in degrees varying according to their specific characters and porosities. The question also occupied the attention of Döbereiner in France, and William Henry, Thomas Graham, Faraday, and De la Rive in England during the first third of last century; but not one of these distinguished men succeeded in evolving a satisfactory theory of the phenomenon, nor, with the exception of the famous "Döbereiner Lamp," was there any practical outcome of their efforts. After a long and abortive controversy between Faraday and De la Rive in 1836, interest in the subject dropped, and was not revived until recent years.

Following the lead of Frederich Siemens, technologists have for many years generally considered that in industrial heating operations contact of all flame with surfaces should be avoided. Indeed, Siemens, who was the first to emphasize the importance of radiation in furnace operations, was insistent in declaring that hot surfaces, by promoting dissociation, must necessarily hinder combustion. In view of the great influence that Siemens exercised on contemporary thought, it is hardly to be wondered at that hitherto the possibilities of surface combustion have not been realized; but Professor Bone was convinced, from the results of many years' investigation, that Siemens was wrong in his pronouncements on this important matter, that the power of accelerating gaseous combination is possessed by all surfaces at temperatures below the ignition-point in varying degrees dependent upon their chemical characters and physical texture.

The immediately succeeding portion of Professor Bone's lecture may be given *in extenso*:

My attention was first drawn to the subject twelve years ago, during the course of an investigation on the mechanism of hydrocarbon combustion at low temperatures, which I was then engaged upon in conjunction with Mr. R. V. Wheeler and others of my pupils at the Owens College, Manchester—now the Manchester University. The subject soon became so attractive that we embarked upon what proved to be a long inquiry into the influence of a great variety of hot surfaces upon the combination of hydrogen and oxygen at temperatures below the ignition point. Since I came to this University, the inquiry has been extended to other cases of slow combustion; and as the result of experiments carried out in conjunction with Messrs. A. Forshaw and Harold Hartley, we are now in a position to give a complete account of the purely scientific aspects of the subjects.

Without, however, anticipating our final conclusions—which will in due course be published in the scientific Press—I may say, with great confidence, that it has been established that all hot surfaces will accelerate gaseous combustion, but in varying degrees dependent upon the temperature and the chemical and physical character of the surface, and that such accelerating influence is connected with the emission of corpuscular electric charges by hot surfaces.

It is, therefore, necessary to distinguish between two possible conditions under which gaseous combustion may occur—namely, (1) homogeneously—that is to say, equally throughout the system as a whole, and (2) heterogeneously, or only in layers immediately in contact with a hot surface ("surface combustion"). It is also necessary to remember that, *cæteris paribus*, the heterogeneous surface combustion is a faster process than the normal homogeneous combustion of ordinary flames.

With regard to this heterogeneous surface combustion, our experiments have proved that at temperatures below the ignition point, the "activity" of a given surface can be enhanced or diminished at will by previous special treatment in a truly marvellous manner. Thus, for example, in the case of the combination either of hydrogen or of carbon monoxide with oxygen in contact with a non-oxidizable metal or non-reducible oxide, the "activity" of the surface may be greatly stimulated by previous contact with the combustible gas, and, conversely, may be diminished by previous contact with oxygen. Again, there is abundant evidence that the actual surface combustion is dependent upon a prior "absorption" (or condensation) of the combustible gas and (possibly also) of the oxygen by the surface—although to what extent the oxygen is involved is not as yet perfectly clear. The "absorbed" (or condensed) gas becomes "activated" (probably "ironized," as the physicists would call it) by association with the surface. Also it has been proved that the activity of a given surface rapidly increases with temperature, according to a compound interest law. Finally, certain important differences have been established between ordinary homogeneous combustion and heterogeneous "surface combustion." Thus, for example, whereas the presence of water vapour certainly accelerates, if it is not essential to, the homogeneous combustion of carbon monoxide, it greatly retards its heterogeneous combustion in contact with a surface such as fire-clay. Or, again, whereas methane has a much greater affinity for oxygen than either hydrogen or carbon monoxide in ordinary flames, a hot surface, by virtue of some "selective" action, will completely reverse the usual order of things, a remarkable circumstance than which no better proof could be afforded of the reality of surface combustion.

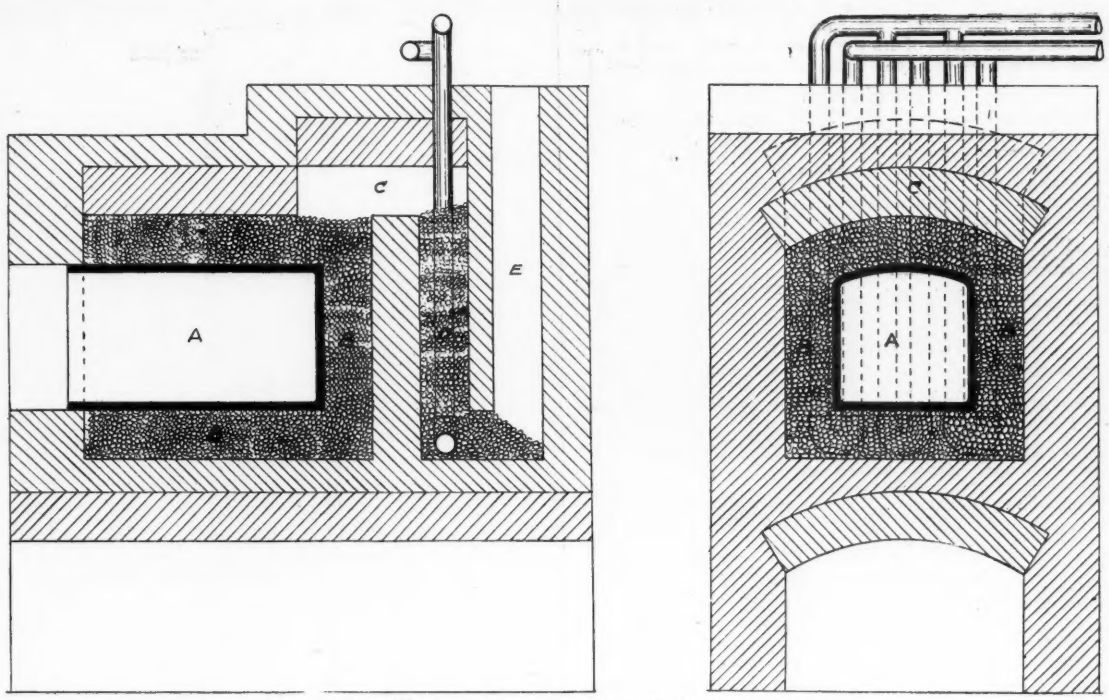
Professor Bone's next contention, which led up to his main theme, was that if hot solids possess the power of accelerating gaseous combustion at temperatures in the neighbourhood of the ignition-point, the same power must also be manifested at higher temperatures, and especially so when the surface itself becomes incandescent. Indeed, he believed that not only does the accelerating influence of the surface upon combustion rapidly increase with the temperature, but also that the difference between the powers of various surfaces (which at low temperatures are often considerable) diminish with ascending temperatures until at bright incandescence they practically disappear. If, therefore, an explosive gaseous mixture is either injected on to, or forced through the interstices of, a porous refractory incandescent solid under certain conditions, greatly accelerated combustion takes place within the interstices or pores, or, in other words, within the boundary layers between the gaseous and solid phases wherever these may be in contact—and the heat developed by this intensified combustion maintains the surface in a state of incandescence without any development of flame. Such conditions, he said, realized his conception of "flameless incandescent surface combustion" as a means of greatly increasing the general efficiency of industrial heating operations wherever it could be conveniently applied. Long since, he became sure of the reality of this accelerated and intensified combustion, and for some years he had been, with the co-operation of Messrs. C. D. M'Court and J. Wilson, endeavouring to embody it in practical form. Their investigations and actual tests under working conditions had established the facts that all surfaces thus act, and that the efficiency attained by such combustion was much in advance of that produced by ordinary gaseous combustion.

Two Processes of Incandescent Surface Combustion.

Leaving the consideration of the theoretical aspects of the subject, Professor Bone proceeded to describe the more important features of the two processes of "incandescent surface combustion" recently evolved at the experimental station at Messrs. Wilsons and Mathiesons, Limited, of Leeds, and now being worked by Radiant Heating, Limited. He described the application of these two processes (diaphragm heating and heating in an enclosed bed or tube of refractory granular material) by reference to lantern views and to the experimental apparatus on the table, some of which was put into operation during the lecture. Owing to the noise of the compressors, &c., most of the demonstrations were carried out at the close of the lecture; the necessary comments and directions as to what was to be observed being simultaneously shown on the screen. In this connection, Professor Bone said:

The distinguishing and essential feature of the new processes is that a homogeneous explosive mixture of gas and air, in the proper proportions for complete combustion (or with air in slight excess thereof), is caused to burn without flame in contact with a granular incandescent solid, whereby a large proportion of the potential energy of the gas is immediately converted into radiant form. The advantages claimed for the new system are: (1) The combustion is greatly accelerated by the incandescent surface, and, if so desired, may be concentrated just where the heat is required; (2) the combustion is perfect with a minimum excess of air; (3) the attainment of very high temperatures is possible without the aid of elaborate "regenerative" devices; and (4) owing to the large amount of radiant energy developed, transmission of heat from the seat of combustion to the object to be heated is very rapid. These advantages are, as I believe, so uniquely combined in the new system that the resultant heating effect is, for many important purposes, not only pre-eminently economical but also easy of control.

Some of the demonstrations and explanations were identical with those given at the Royal Institution and at the Glasgow meeting of the Institution of Gas Engineers. These have already



Large Muffle Furnace with Arrangement for Air Regeneration.

appeared, with many illustrations, in the "JOURNAL" [Vol. CXIV., pp. 22, 98, and 914); so they need not be repeated here. First the diaphragm heater was dealt with and the following features emphasized:

1.—Actual combustion is confined to a thin layer ($\frac{1}{8}$ in. to $\frac{1}{4}$ in. only) immediately below the surface.
2.—Combustion is perfect; no unburned gas ever escaping when air and gas proportions are once properly adjusted.
3.—The temperature can be promptly altered at will by varying the rate of feeding the gaseous mixture.
4.—The diaphragm can be placed at an angle.
5.—The method is applicable for use with any combustible gas.
6.—The combustion is independent of the external atmosphere; a diaphragm remaining equally incandescent when plunged into a vessel of carbon dioxide.

Many of the visitors associated with the gas industry were greatly interested in hearing that a new diaphragm had been devised of the "injector" type. This is meant to be connected to a gas supply at a pressure of 2 lbs. per square inch, and will draw in its own air from the atmosphere in sufficient quantity for complete combustion. An example of this type was on the demonstration table, and was subsequently freely handled and discussed by gas representatives, who regretted that they had not seen it in operation. Its nozzle, air adjuster, Venturi tube, &c., all came in for comment at this subsequent informal examination.

Professor Bone hinted at several possible industrial uses of this diaphragm heating, as, for example, in grilling, roasting, and toasting, and proceeded to illustrate one greatly important possibility for its extensive use—viz., in evaporation. The experiment was the beautifully effective one given at previous demonstrations, of evaporating down a solution of sodium silicate (water glass) which would have been impossible of satisfactory accomplishment in the ordinary way.

Heating of Crucible and Muffle Furnaces.

The application of the new method of heating to crucible and muffle furnaces was then shown. At the Glasgow lecture, the proof given of the attainment of a temperature approaching 2000° C. was the exhibition of specimens of carborundum (silicon carbide) oxidized to silica. Professor Bone now mentioned that with ordinary coal gas and air an alundum crucible of an extremely high refractory character containing a Seger cone No. 39 (which registers, according to the latest determination of the Reichsanstaldt in Berlin, a temperature of 1880° C.) has been completely melted down in a few minutes; showing that a temperature approximating to 2000° C. had been obtained. Platinum is easily melted (1775° C.); and this was actually accomplished at the subsequent demonstration. Naturally, the maximum temperature obtainable in any case will depend upon the volume and heat capacity of the products for a given heat development in the bed. With a producer gas of low calorific intensity, such as Mond gas, about 1500° C. would probably be the maximum temperature obtainable without recuperation. With it (which would be quite practicable), in all probability this limit would be considerably exceeded.

The high heating efficiency of a muffle furnace on this system was strikingly shown by the results of one of the most recent tests, as given below:

Temperature in Middle of Muffle.			Gas Consumption to Maintain Temperature Constant.		Temperature of Products.		
Deg. C.		Deg. Fahr.	Cub. Ft. per Hour at 15° C.		Deg. C.		Deg. Fahr.
815	..	1449	21·0	..	540	..	1004
1004	..	1840	35·3	..	645	..	1195
1205	..	2201	58·0	..	870	..	1598
1424	..	2596	79·0	..	1085	..	1985

Mean net cal. value of gas=540 B.Th.U. per cub. ft. at 15° C.

A muffle 9½ in. long by 5¼ in. wide by 3¼ in. high (inside dimensions) was heated to temperatures between 815° and 1425° C., with a fully aërated coal gas of 540 B.Th.U. (net) per cubic foot. The conditions under which the test was carried out made possible the accurate determination of the rate of gas consumption requisite to maintain the muffle at any constant temperature between 815° and 1425° C. The temperatures given in the first two columns are those recorded by a standard thermo-junction placed in the middle of the muffle. The temperature of the escaping products was also ascertained by means of a standard thermo-junction. It should be particularly observed that the temperature of the products is in every case some 300° to 350° C. lower than that of the muffle, and that even with a muffle temperature of 1424° C., there was no appearance of flame whatever at the top of the furnace. The gas consumptions as recorded in the middle column are extremely economical in comparison with ordinary heating by flame contact. Thus, for example, in a similar test with a muffle of the same size heated by flame contact in a furnace of modern design, the gas consumption to maintain the muffle at 1055° C. (which was the maximum temperature obtainable) was 105 cubic feet per hour; whereas by interpolation from the above numbers the consumption in the "surface combustion" furnace at the same temperature would have been about 43 cubic feet per hour only. In other tests, the gas consumption for the maintenance of a given temperature was about half that of the best modern furnaces of the ordinary gas-heating arrangements tested against them.

A new application of this form of heating had been arranged in the shape of a regenerative furnace, 18 in. by 3 in. by 3 in. The cold air was led down a pipe embedded in granular material which surrounded the furnace; it then passed up through the material, and was supplied to the mixing-chamber. By thus preheating the air to 500° to 600° C. at the expense of the waste gases, a further 20 to 25 per cent. can be saved on the already very low gas consumptions for a given temperature. Whereas before a gas consumption of (say) 50 cubic feet was needed to maintain a given temperature, now from 37 to 40 cubic feet sufficed. By this means, it is also possible to considerably raise the maximum temperature obtainable when using low-grade producer gas—a very important consideration.

Boiler Heating by Surface Combustion.

Among the many engineering experts and students present, keen interest was visible when the surface combustion heating of multitubular boilers was dealt with. This was made plain by slides and by an actual three-tube boiler on the table ready for steam-raising. After the lecture, this was put into operation and 100 lbs. steam pressure secured within 15 minutes of lighting-up. The

ten-tube experimental boiler at the Armley works was described in detail in the "JOURNAL" for April 11, 1911 (p. 100). The following data were given of its work (Dec. 8, 1910); and it was stated that the figures had been repeatedly verified since:

Tests of Boiler.

Gas-air pressure	17·3 in. water-gauge
Pressure of gaseous products entering feed-water heater	2 in. "
Boiling-point of water (100 lbs. steam pressure)	170·0° C.
Temperature of combustion products—	
Leaving boiler tubes	230·0° "
" feed-water heater	95·0° "
Temperature of water—	
Entering feed-water heater	5·5° "
Leaving	58·0° "
Evaporation per square foot of heating surface per hour	21·6 lbs.

Heat-Balance of Boiler.

Gas consumption	996 cubic feet per hour
Gas calorific value	562 B.Th.U. per cubic foot
∴ Heat supplied to boiler	559,800 B.Th.U. per hour
Temperature of feed water	5·5° C.
" steam	170·0° "
Actual weight of water evaporated (which, in terms of water evaporated from and at 100° C., would be 550 lbs.)	450·3 lbs. per hour
∴ Heat transmitted to water	450·3 × 1172 = 527,800 B.Th.U. per hour

$$\text{Ratio } \frac{527{,}800}{559{,}800} = 0{\cdot}943$$

Analysis of Flue Products.

Carbon dioxide	10·5	10·8	In two different tests
Oxygen	1·8	1·4	
Nitrogen	87·7	87·8	
Hydrogen, carbon monoxide, and methane			No traces

Professor Bone next referred to the 110-tube boiler for coke-oven gas lately erected at the Skinningrove Iron-Works in Cleveland (Yorks.), which was described and illustrated in the "JOURNAL" for Jan. 2 last (p. 27). It was further illustrated at the lecture by lantern slides. The plant was successfully started on Nov. 7, 1911, for a month's trial run—day and night continuously—after which it was opened up for an official inspection by the representative of a Boiler Insurance Company. The plant worked without a hitch throughout the trial, and was then taken over by the Company. The official inspection showed the tubes to be in good condition and free from scale; indeed, owing to the very rapid rate of evaporation, the scaling troubles experienced with other types of multi-tubular boilers were completely obviated, the scale being automatically shed in thin films (about 1-30th inch thick) from the tubes as fast as it formed. During the trial, the average temperature of the waste gases leaving the feed-water heater was about 75° C., which, in itself, is a sufficient proof of the thermal efficiency of the plant. After the month's trial run and subsequent inspection, the plant was restarted, and has since been in continuous operation to the entire satisfaction of the Manager of the coke-oven plant (Mr. E. Bury, M.Sc.), who, on Feb. 10 last, reported to Professor Bone as follows:—

You will be glad to hear that your boiler continues to work very satisfactorily. . . . We have experienced no practical difficulties of any kind. . . . The working of the boiler is almost automatic. . . . The temperature of the waste gases leaving the plant is from 78° to 80° C., which is ample proof of the boiler efficiency. Generally, I consider that the boiler has come up to your every expectation; and it is certainly the cheapest method of raising steam which has yet been devised.

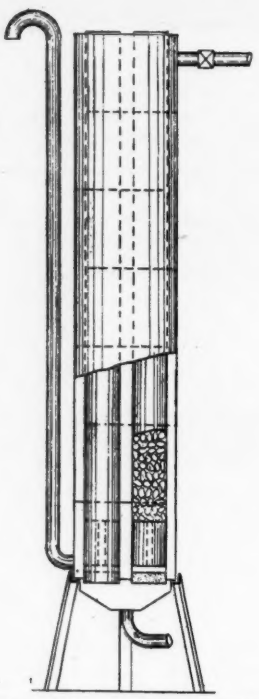
Professor Bone pointed with justifiable pride to the high success achieved by this the first large-scale adaptation of his system. It had been working uninterruptedly since Nov. 7, 1911, except for a short interval solely caused by the coal strike. A gratifying additional recommendation of the system had presented itself in that no scale adhered to the boiler-tubes. The water was of 5° to 6° of hardness, and the only deposit produced seemed to be a thin film which, when it got to a thickness of about 1-30th inch, broke off and fell away—thus making the boiler self-scaling. It was simpler in construction than ordinary boilers, as it needed no large chimney or brickwork around it. Its front plate never became hotter than the water, so that it would develop fewer leaky joints. It had a similar steep evaporating gradient to the experimental boiler, the percentages of work accomplished by the consecutive thirds of the length of the tubes being 70, 22, and 8. Its mean evaporative power was 20 lbs. per square foot of surface.

WATER HEATING BY SURFACE COMBUSTION.

Having been asked if the system could not be arranged for domestic use, merely for heating water (say) for baths, Professor Bone and his colleagues prepared such an adaptation; and it was on view. It was a copper cylinder with a heater, measuring some 4 ft. by 3 in., containing two tubes. It was "fool-proof," with a special design to prevent back-firing. The following figures were given of a test made upon it:

Gas consumption	340 cubic feet per hour
Gas calorific value	545 B.Th.U. per cubic foot
Water heated	2283 lbs.
Water temperature raised from	44·4° to 128° Fahr.
Temperature of waste gases	147° Fahr.
B.Th.U. utilized per cubic foot	562

$$\text{Ratio } \frac{562}{45} = 1{\cdot}03$$



Water-Heater for Domestic Purposes.

It may be mentioned that in the foregoing calculation the net calorific value of the gas was taken. As, however, the products were at so low a temperature, some of the gross value has been reckoned in.

Professor Bone did not make any comment on the wonderful efficiency thus shown, other than remarking parenthetically that the inquirer, after all, did not purchase the heater.

The lecture concluded with some observations on the application of surface combustion to melting metals and alloys—a subject dealt with in the "JOURNAL" for Jan. 2 last (p. 28).

A vote of thanks to the lecturer was moved by Dr. Pridgin Teale, F.R.S., a veteran Leeds physician, whose work in bygone years on improvements in fire-places is embodied in nearly all modern types of coal-fires,* and whose presence on the occasion was singularly opportune. The vote was seconded by Mr. Fred. Kitson, a Director of the large and universally-known Leeds engineering establishment familiarly known as "Kitson's." After these formalities, the practical demonstrations were given by Professor Bone and his assistants; and it was only at a very late hour that the last of the audience left the hall.

The following morning, a further special demonstration was given at the Armley works of Radiant Heating, Limited, mainly for representatives of the general and engineering Press.

* A further patent by a member of the family was noticed in the "Register of Patents" last week.—ED. J.G.L.

Masonic.

The first regular meeting of the Evening Star Chapter, No. 1719 was held at the Freemasons' Hall, Great Queen Street, on Tuesday of last week—Ex. Comps. W. A. Surridge, Charles Meiklejohn, and J. W. Broadhead occupying the three Principals' chairs. There was a long list of masonic brethren waiting to join the Chapter; and of these, the following brethren were exalted: W. Bro. C. W. Offord, W.M. of the Evening Star Lodge; W. Bro. A. E. Broadberry, W. Bro. F. W. Cross, and W. Bro. Cyril Davis, Past Masters of the Evening Star Lodge; Bros. Henry Kearns, C. W. Bland, and Rae Normand, M.M. of the Evening Star Lodge, and George Hands, of the Claremont Lodge, No. 1861. Comp. W. R. Silk, of the Dobie Chapter, No. 889, was elected as a joining member. Subsequently a number of proposals for exaltation and joining at the November meeting of the Chapter were received.

The attention of readers of the "JOURNAL" who are Freemasons may be called to two Masonic songs which have been arranged for, and sung by, W. Bro. Matt. Dunn. Their titles are "The Visitors' Song" and "The Noble Art Divine," and the words of both are by W. Bro. J. A. Henderson, P.M., P.P.G.S.; the music of the former being by Bro. A. A. Stokoe, and of the latter by W. Bro. T. N. Macbenn, P.M., P.P.G.O. They are effective compositions, and are arranged for the brethren to participate in their rendering. The two songs, which are printed together, are published by Messrs. Banks and Son, of York and Scarborough, at the price of 1s. net; and they may also be had of W. Bro. Dunn, of "Ivanhoe," Stockton-on-Tees. The proceeds are to be devoted to the Royal Masonic Institution for Girls, in connection with the festival of the present year.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Pontypridd.

Favoured by fine weather, a large muster of members of the Institution—in fact, it was perhaps a record attendance for this organization—gathered last Thursday morning in the busy and rapidly growing town of Pontypridd, the home of the President, Mr. E. H. Swain, who is Manager of the gas-works there. A full programme had been mapped out; and it was found necessary, owing to shortness of time, to curtail the business *agenda* by postponing until the next meeting the consideration of one of the two papers submitted. The proceedings, too, were not confined to gas, inasmuch as, after the members had lunched with the President, and before the gas-works were inspected, a visit was paid to the Council's electricity generating and tramway station. Gas and electricity live side by side at Pontypridd; for the two works are situated close together in the Treforest portion of the area. The Pontypridd Urban District Council are evidently well satisfied with their gas undertaking; and it was gratifying to note the appreciative terms in which members of this body referred to their Manager. In every way the day proved a very successful one; the only matter for regret being the unavoidable absence of several well-known members of the Institution.

THE BUSINESS MEETING.

For the transaction of the business portion of the proceedings, the members assembled in the handsome Council Chamber (which had been kindly placed at their disposal for the purpose; the chair being taken by Mr. E. H. Swain, the President, who was supported by Mr. J. H. Canning, of Newport, the late President.

The Late Chairman of the Cardiff Gas Company.

The President remarked that, before they commenced the transaction of the business before the meeting, he had a painful duty to perform. That was to announce to them the death of Surgeon-Colonel Taylor, the Chairman of the Cardiff Gas Company. He was well known to every member, and was one of the best friends of the Association. Always ready to welcome them at Cardiff, his time was ever at their disposal. He would ask them to show their sympathy with the relatives.

This the members did by rising silently in their places.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. Octavius Thomas, of Pentre) then read the minutes of the last general meeting; and they were confirmed by the members.

New Members.

The following new members were next elected, on the proposition of Mr. H. D. Madden (Cardiff), seconded by Mr. J. Mogford (Briton Ferry): Messrs. Fred. Robinson, of Brecon; T. B. Pearson, of Pontypool; T. H. White, of Cwmbran (Mon.); A. E. Davey, of Aberdare; Harry H. Langford, of Cardiff; and Arthur G. Lofthouse, of Treharris.

Annual Report and Accounts.

The Hon. Secretary then read the seventh annual report of the Council. This stated that during the year three members joined the Institution; and, through leaving the district and other causes, five resigned. This left the membership 157 at the end of the year. The receipts amounted to £28 17s. 6d., the payments to £25 13s. 6d.—leaving, with the balance of £22 12s. 10d. brought forward from the previous year, the sum of £25 16s. 10d. in the hands of the Treasurer. A copy of the "Reports of District Associations" for 1911 had been sent to all members who had paid their subscriptions. The Special Purposes Section inaugurated at Bargoed last May had held five meetings during the year; and twenty gas companies and local authorities had joined the section. Many subjects of interest had been discussed, which had been of great benefit to members; and the Council recommended those who had not joined to consider the matter.

The President said they would be pleased to note from the report that the Association continued to flourish, both in point of membership and finances. He was sure the Council would be gratified if they could present a much longer list of candidates for admission; and here, he thought he might remark, there was an undoubted opportunity for a little enthusiastic recruiting.

The report was adopted, on the motion of Mr. L. J. Langford (Abertillery), seconded by Mr. Evan Rees (Blaina).

Election of Office-Bearers.

The following were the officers elected for the ensuing year:—

President.—Mr. T. E. Franklin, of Barry.
Vice-President.—Mr. H. D. Madden, of Cardiff.
Hon. Treasurer.—Mr. Henry Morley, of Teignmouth.
Hon. Secretary.—Mr. Octavius Thomas, of Pentre.
New Members of Council.—Mr. J. E. Kenshole, of Merthyr, and Mr. F. C. White, of Blaenavon.
Hon. Auditors.—Mr. L. J. Langford, of Abertillery, and Mr. J. A. Boucher, of Maesteg.

The President, in proposing the election of Mr. Franklin as President, said it had been the hope of the Council that the Senior Vice-President, Mr. George T. Andrews, of Swansea, would be willing to allow his name to be submitted to the members; but, to their very great regret, Mr. Andrews felt that the state of his health, as well as the demands he expected to be made upon his time, rendered this quite impossible, at all events for the present. It was their hope, however, that on some future occasion Mr. Andrews would see his way clear to give the Association the benefit of his guidance. Under these circumstances, he had the greatest pleasure in proposing the election of Mr. Franklin, the Junior Vice-President. Mr. Franklin had been among them for some considerable time; and the more they knew of him, the more they liked him. His professional qualities were such as to merit this, the greatest honour which it was in the power of his professional brethren to bestow; and he felt sure that in him they would have a President of whom the Association would have every reason to be proud.

Mr. J. H. Canning (Newport) proposed the election of Mr. Madden as Vice-President, and said that his sterling merit and ability were such that the members could not possibly make a better choice.

Subscription to the Gas Institution Benevolent Fund.

The President pointed out that last year the members decided to subscribe the sum of £2 2s. to the Benevolent Fund of the Institution of Gas Engineers; and a similar opportunity offered itself on this occasion. He felt sure it was unnecessary for him to plead the cause of those who, through no fault of their own, were no longer able to keep up in the race, but had fallen out by the way.

Mr. Madden proposed that the sum named should be subscribed; remarking that this was a collective subscription, and that they ought also all to individually subscribe to the fund. He had heard of cases in which the fund had been particularly good in its application.

The Hon. Secretary, in seconding, stated that he had been on the Benevolent Fund Committee, and there had been some very deserving cases brought forward. The members ought really to subscribe more largely to the fund than they did—he did not mean as an Association, but as individuals.

The proposal was agreed to.

Some Notes on Furnace Control.

Mr. Madden then read a paper entitled "Some Notes on Furnace Control;" and this, together with a report of the discussion to which it gave rise, will be found on p. 443.

The President remarked that Mr. Madden had given them a thoroughly practical paper; and the hints contained in it would repay any consideration that might be given to them. He, for one, hoped to take advantage of some of the suggestions.

A hearty vote of thanks was accorded to the author, on the proposition of Mr. F. C. Mortlock (Whitland), seconded by Mr. A. J. Ward (Cardiff), and supported by Mr. L. J. Langford.

Mr. Madden, in acknowledgment, said he did not bring his paper forward as a controversial matter, but as something that might induce the members to go on experimenting.

Gas Testing for Small Works.

Mr. Evan Rees (Blaina) had prepared a paper on "Gas Testing for Small Works;" but the time at disposal was too short to permit of it being read. It was therefore decided to postpone until the next meeting the consideration of the paper—which is reproduced on p. 445.

Draft Scheme for the Education and Certification of Gas-Fitters.

The President said the question of the education and certification of gas-fitters had been before them on a previous occasion; and he hoped the members had been able to give it the consideration which so important a subject deserved. A draft syllabus had been prepared, and he would ask the Secretary to read it.

The Hon. Secretary explained that this question had been considered by a Committee consisting of members of the various District Associations throughout the country; and that a scheme had been drawn up which had been published in the Press. [See "Journal," Feb. 27 last, p. 571.] He then read the draft syllabus.

The President remarked that the syllabus seemed to him to be a thoroughly practical one.

Mr. J. H. Canning said the scheme was an excellent one; and they were all agreed upon the importance of teaching all those connected with the gas industry in every grade, but particularly their gas-fitters—more especially in view of the heavy competition they were experiencing from their rivals the producers and purveyors of electricity. A number of borough and county councils—including, he believed, the County Council of Glamorgan—had recognized the importance of the subject, and had either provided, or were doing their best to provide, facilities. The point to which he wished to draw attention was that, however excellent this syllabus might be, it made no provision for what was in reality the *crux* of the whole question with them—namely, the securing of a teacher. It provided for the formation of classes, and what was

to be taught in them; but the difficulty in this district was to obtain a competent teacher, and, of course, the furnishing of the necessary funds to pay him. He would like to appeal to all local authorities to endeavour to meet the gas industry in this matter, and provide accommodation, and, if possible, some part at any rate of the cost of training gas-fitters, who, after all, now formed a not very inconsiderable proportion of the population. Facilities were, he knew, offered in most towns for plumbers, who were employed upon water-fitting; and gas-fitting was, in the majority of places, practically as extensive in its scope as plumbing. Certainly, gas-fitting was a subject that might form part of the syllabus of every public technical institution.

Mr. H. H. Langford (Cardiff) remarked that, so far as Cardiff was concerned, the Technical Committee of the Corporation had formed classes for gas-fitters; but this only applied to apprentices. After strenuous endeavours on the part of the Cardiff Gas Company, they induced the Chairman of the Technical Committee to see his way clear to form a class; but the difficulty which arose was as to how to fit this class in with the other classes that were being held. It was found during the first session that the classes held at night did not have a very good attendance; for the reason that the lads, who had worked all day, did not feel inclined to go out again in the evening. It was therefore suggested that for the second course it might be possible to form an afternoon class. This was done; the Directors of the Gas Company consenting to let the lads off. In this way, they got all apprentices to attend; and they had been able to form two classes—one elementary, and the other advanced. The course was graded; and they had a very excellent teacher. He took the students through practical work in the afternoon from 4 until 5 o'clock; and from 5 to 6 o'clock he gave them theoretical work. Questions were set; and the lads had some home work to do. The examination for this session had recently been concluded; and he (the speaker) had had the pleasure of going through some of the home-work papers. Certainly the lads had displayed great intelligence. In some cases possibly they had been assisted; but they evidently took a keen interest in their work. With regard to certification, he thought this would be somewhat difficult—especially if classes were formed by the various Technical Committees, because these Committees would not allow a recognized gas-fitter to attend any classes. They must be apprentices of one or two years' standing. If they had served their apprenticeship, the Committee would not allow them to attend the class. Another important question was as to whether they could possibly get the Technical Committees to see eye to eye with them as regarded plumbing. The gas industry now had a lot of hot-water work to do; and it was necessary that a gas-fitter should learn a certain amount of plumbing. Up to the present, the master plumbers had tabooed the suggestion; and it had been necessary to rest content with the gas-fitting portion. That was to say, the Technical Committee were asked whether they would allow gas-fitters to join the plumbers' classes; and the master plumbers objected to them doing so. It seemed to him that they should thresh out the question of whether a fitter should be permitted to attend plumbing classes for the special purpose of learning how to do hot-water work.

The Hon. Secretary proposed the adoption of the scheme. He expressed the opinion that the statement of Mr. Langford that the classes were confined solely to apprentices applied to Cardiff only, and not to the county, because he knew that some of his own fitters, and outsiders as well, had attended classes at Pontypridd.

Mr. H. H. Langford seconded the proposal.

The President remarked that in Pontypridd he had experienced no such difficulty as Mr. Langford had found in Cardiff. They did, however, have a good deal of trouble before they could get the class started. They had three tries. Most of the men employed in the local gas undertaking attended the classes last winter, and men from other places also came down; and they always found themselves to be welcomed. After the second failure to get the class established, they pointed out to the men that they were ratepayers, and had as much right to consideration as plumbers or any other people; and he believed the men urged this view of the matter. At all events, by all pulling together, they got the classes started; and they had proved so successful that he felt sure they would go on next year without any trouble at all. A teacher was advertised for; and as to funds there had been no trouble. The County Council had maintained the classes in an excellent manner; and the gas-works had lent out apparatus at different times. If this scheme could be extended all over the country, it would prove of great benefit, not only to their own but to other districts as well.

The motion was then agreed to.

The District Council Thanked.

The President, in proposing a vote of thanks to the Urban District Council for the use of the chamber in which the meeting was held, pointed out that several Councillors were present.

Mr. A. W. Branson (Caerphilly) seconded, and Mr. J. E. Kenshole (Merthyr) supported, the vote, which was carried.

Mr. Moses Jones, the Chairman of the Electricity Committee, in response, said they were always pleased to see visitors at Pontypridd. The Council were particularly glad to welcome the members of the Institution, and hoped they would have an enjoyable time. The Pontypridd Council was small, but it was fairly enterprising.

Mr. David Evans also acknowledged the vote. He said he came to the meeting to obtain knowledge, and also with the intention of paying the respect which was due to their President. He was delighted to think the members had recognized the capabilities of Mr. Swain by appointing him President. They in Pontypridd knew his abilities, and appreciated them. He hoped the Institution would go on successfully, and be a strong competitor of electricity, which was a force in the country now. His Council were very pleased with both their undertakings, which were doing well and giving every satisfaction. He was certain they had found their President to be the soul of brevity. It was much to the advantage of a Council to have a Manager like Mr. Swain, who could be brief and to the point. Members who were busy men had no desire for long reports; and some of them were inclined possibly to think occasionally that time was taken up in preparing such reports which could be utilized to better advantage.

Place of Next Meeting.

On the suggestion of the President, it was decided to leave the Council to fix upon the next place of meeting.

This concluded the business portion of the day's proceedings.

Luncheon.

The members then adjourned to the Park Hotel, where, on the invitation of the President, they partook of a well-served luncheon. Before rising, there were a few short speeches. The Loyal Toast having been honoured, Mr. J. H. Canning proposed "The Urban District Council of Pontypridd;" remarking that the town was a rapidly growing one, and that both the gas and the electrical undertakings were flourishing. Pontypridd had many advantages, and one of them was the possession of so able a Gas Manager as Mr. Swain. The members of the Association were agreed that the Council could not have a better man. Mr. T. Taylor, the Chairman of the Gas Committee, who responded, said, in one way, he had a longer connection with the gas undertaking than anyone else present. He had been associated with the works more or less since 1868. At that time Mr. Cocker was Engineer; and a very good man he was. His (the speaker's) father was laying gas-mains; and he himself was sent out to try and find leaks. No doubt, they would not be able to sell gas so cheap if they did not manufacture it cheaply; but later on they would have a further improvement in their gas-works. In a short time, he hoped that they would have mechanical stoking plant installed, which, he believed, would reduce the cost of manufacture. He hoped that the Association would long live to hold meetings for the self-education of the members, for the benefit of their respective undertakings. Mr. Moses Jones submitted "The Wales and Monmouthshire District Institution of Gas Engineers and Managers." He said one feature of such organizations which he greatly appreciated was the unselfishness of their methods. When once a manager knew of anything, the Association was the means of letting every other manager learn about it. Thus, if one town benefited from an invention or a discovery, it was passed on all over the country. He would suggest two matters to which they might apply their minds at their next meeting. The first was to devise ways and means whereby a gas manager could live on a lower salary [A Voice: "Impossible."]; and the second was the discovery of a joint which would hold with the ground subsiding underneath it and a 10-ton engine passing over it. [Laughter.] Mr. Swain briefly replied, emphasizing the useful work done by the Association. He said they were pleased to note that, as the Association met from time to time in different towns under the auspices of the various companies or authorities, more and more was the corporate value of this and similar organizations recognized, as it had been by the proposer of the toast.

In a special car, the party were then taken to Treforest, where they were first conducted over the electricity generating and tramways station, under the guidance of Mr. J. E. Teasdel, the Engineer and Manager.

A VISIT TO THE GAS-WORKS.

Subsequently the party were escorted over the gas-works by the President and Mr. Fred Thomas, his Assistant. The works, which are in a pleasant situation, and on a sloping site, were designed by Mr. Thomas Newbigging, and completed in 1896. The site occupies about 5 acres of ground; and everything has been arranged to admit of further extensions, when they should become necessary. Though the works are therefore modern, it must not be assumed that the supply of gas in Pontypridd dates only from so recent a time. As a matter of fact, the manufacture of gas was commenced by a Company as long ago as 1850; and it was when the undertaking was acquired by the District Council in 1895 that it was decided to erect new and larger works in the neighbourhood of Treforest. The site of the old works was not the most convenient possible, as it was situated right in the centre of the town, where there were no railway facilities, and land was not available for due expansion. There is, however, still a holder of 85,000 cubic feet capacity at this station, from which part of the town is supplied.

On the new site a siding from the Alexandra Docks Railway runs right into the works; and on the other side there is available for use, as occasion requires, the Glamorgan Canal. The coal is discharged from railway waggons on an overhead gantry into a coal-store beneath, which is capable of holding 1500 tons. The shunting on the sidings is carried out by means of wire-rope haulage; and the Council own a number of hopper-bottom

waggons, from which the coal can be easily discharged. New oxide, &c., is unloaded in a similar manner. The retort-house contains five beds of eight through retorts, 22 in. by 16 in. by 20 ft. long; but the building was constructed to contain three more beds, when these should be called for. At present, hand-charging is in vogue; but it will be recalled that, when speaking at the luncheon, Councillor Taylor, the Chairman of the Gas Committee, hinted that an installation of mechanical stoking is in contemplation. Four-hour charges of 2½ cwt. each are worked; and a man carbonizes in his eight-hour shift 2 tons, or sixteen charges. At the end of the bench there are two tar-towers and an 8-inch retort-house governor. The coke is loaded into railway waggons by means of an elevator, erected by Messrs. S. S. Stott and Co., and having a capacity of 20 tons per hour. The substantial and neat design of the retort-house was noted. Cannel is used for enrichment purposes; and this is placed in a special store which will hold about 2000 tons.

In addition to the coal-gas manufacturing apparatus, there is a carburetted water-gas plant of a capacity of 250,000 cubic feet per day, which was installed some seven years ago by the Economical Gas Apparatus Construction Company. The boilers are 6 feet in diameter and 20 feet long, and work at a pressure of 120 lbs. per square inch. The blowers are driven by 20-H.P. engines in duplicate. There is an oil-storage tank with a capacity of 50 tons: and this is so arranged that it can be filled by gravitation from the railway siding. In connection with this plant, there is a relief holder of 52,000 cubic feet capacity, which was removed from the old gas-works and re-erected at Treforest by Messrs. Biggs, Wall, and Co. The carburetted water gas, as made, is measured by a rotary meter before passing through the exhauster, at the inlet of which it is mixed with the coal gas.

The coal-gas plant generally is designed for a make of 500,000 cubic feet daily. There is a Clapham patent tubular condenser, and two exhausters—one a Waller with a capacity of 20,000 cubic feet per hour, and the other a Donkin to pass 40,000 feet. The gas next passes through a Dempster "Livesey" tower-scrubber into a Laycock and Clapham washer. The purifier-house is a well-ventilated stone building with a slate roof. There are in it four purifiers of the water-lute type, 22 ft. 6 in. square, by Messrs. R. & J. Dempster, with Weck patent centre-valves. They are used for oxide, and are of the elevated type; the discharging being accomplished from the bottom. The oxide for filling is taken up to the stage floor by an elevator having a loading capacity of 10 tons per hour, and driven by a gas-engine. This elevator feeds the oxide into a movable shoot, so that it can run into any one of the four boxes. The purifiers are opened by means of a hydraulic ram; and when the covers are raised to the necessary height, they are caught by rests fitted at each corner. In addition to the four boxes, there are two 24 feet square by Messrs. Jordans, of Newport, which are used as lime check-boxes. These are of the luteless type, with rubber joints. The whole of the gas passes through a Braddock rectangular station meter of 25,000 cubic feet per hour capacity; and this is housed in a building containing also a photometer, &c., and two governors. Storage capacity is provided by a gasholder, with guide-framing, holding 520,000 feet, erected by Messrs. C. & W. Walker.

The Pettigrew sulphate of ammonia plant has a capacity of 15 cwt. per day; and for this there is an acid storage tank provided at the end of the railway siding, which can be filled by gravitation, and from which similarly the acid flows into the sulphate plant. The whole of the works mains are 18 inches in diameter; and it may be mentioned that there are about 41 miles of mains over the district.

THE COKING TESTS OF COAL.

At the Meeting of the London Section of the Society of Chemical Industry held at the Chemical Society's Rooms, Burlington House, under the chairmanship of Mr. E. Grant Hooper, on Monday of last week, Dr. R. Lessing described and showed a new apparatus which he has devised for making coking tests of coal. The paper, giving a full description of the apparatus, was not read, but will be published later in the Society's "Journal."

Dr. Lessing referred first to the old methods of determining in the laboratory the volatile matter and coke produced by the carbonization of coal, in which one gramme of the coal, finely powdered, was heated in a platinum crucible in a bunsen flame until the evolution of gas ceased. The results varied according to small differences in the manner of performing the test; and there was, as a consequence, a want of conformity between the results obtained by different analysts. An attempt to standarize the method, by prescribing the exact conditions in which the test should be conducted, was made by a Committee of the American Chemical Society in 1899. By this method, the time of heating was limited to seven minutes. The method had been adopted by Professor Constam and his collaborateurs, and had become generally accepted. It was, however, faulty in some respects; and the results were not so concordant as was desirable. The factors which made for increase in the result obtained for the volatile matter in coal examined by this method were: (1) The burning of the coke in the oxidizing atmosphere, which it was impossible to exclude entirely in making the test; and (2) loss of coal by spitting, which was very liable to occur with certain coals, and with very many coals when very finely powdered. Factors which, on the other hand, caused a decrease in the result obtained for volatile matter were: (1) Insufficient coking of the coal in the time allowed for the test; and (2) secondary catalytic deposition of carbon on the walls of the crucible. On consideration of these sources of error, the author came to the conclusion that they were largely due to the capacity of the vessel or crucible used for the test—being fully ten times that requisite for the one gramme of coal taken for the test.

The idea occurred to Dr. Lessing that the use of expensive platinum vessels could be avoided by the adoption of fused quartz or silica. At the same time, he reduced the size of the vessel, and, with a view to heating it uniformly and at a definite temperature, adopted a form of electric furnace for the heating. His principal object was to compress the working space and to avoid free space in the reacting vessel. The electric-furnace consisted of a number of coils round a silica tube placed in non-conducting material, such as kieselguhr. One gramme of the powdered coal was placed in another silica tube, which fitted within the furnace tube, and a third silica tube passed inside that containing the coal, and resting on the latter, avoided free space above it. The temperature of the furnace was controlled by means of a preliminary resistance and a rheostat; and the temperature could thereby be standardized so that it was the same for all tests. On the other hand, comparative tests of the coal could be made at different temperatures. In the experiment which Dr. Lessing carried out with the apparatus at Burlington House, he put the tube containing the charge and the inner tube, serving as a piston resting on the charge, into the furnace tube, and pointed out that, shortly after the current was turned on, the moisture could be observed coming off from the coal. This was followed by the light tar, and then by the heavy tar. When the vapours ceased to be evolved, the coking of the charge was complete. He contemplated elaborating the apparatus by providing for the collection and measurement of the gas evolved; but this presented some difficulties. He had also tried introducing steam to the charge through a small quartz tube, in order to study the effect of the formation of water gas during coking. The method gave extremely consistent results; and its accuracy depended largely on the exclusion of waste space from the reacting vessel.

Discussion.

Mr. W. J. A. Butterfield, who opened the discussion, congratulated Dr. Lessing on the evolution of the new method of conducting coking tests, which he thought should prove very valuable. He (Mr. Butterfield) believed he could take a small amount of credit for having early endeavoured to get the method of estimating volatile matter in coal suggested by the Committee of the American Chemical Society adopted as the standard method in this country. The standardization of the method was of great importance if concordant results were to be obtained. By the American method, the weight of the platinum crucible to be used was specified; but he did not remember that its dimensions were given, and it seemed to him possible that a narrow vessel, such as Dr. Lessing had used, might be employed with the gas-flame instead of with the electric furnace. Had Dr. Lessing tried this? He would also like to know if Dr. Lessing had tried heating up the outer tube or retort of the furnace before inserting the tube containing the charge, instead of starting with the outer tube cold. It seemed to him that starting with the furnace hot more nearly reproduced the conditions of the carbonization of coal on works. Subsequently, Mr. Butterfield asked if Dr. Lessing had tried the effect of weighting the piston-tube which rested on the charge of coal with a view to imitating the compression of the charge of coal, as was usual in many types of coke-ovens?

Dr. Harold G. Colman also congratulated Dr. Lessing on his paper, and said that the method seemed to him very valuable for comparing different samples of coal, and the cokes obtained from them. He had had the advantage of examining the samples of coke shown by Dr. Lessing, before the meeting, and the longitudinal sections which could be obtained by the method were especially instructive. The method should throw a good deal of light on what went on in the coking process, though he would warn people against making deductions as to the behaviour of coals being the same when carbonized in the test apparatus and on the large scale. The method should be useful for studying the effect of mixing different coals on the character of the coke obtained. The colour noticed with the coke from one sample of coal was probably merely a surface effect.

Mr. F. M. Perkin inquired if Dr. Lessing had tried conducting the tests while maintaining a vacuum over the charge.

Mr. H. Hemingway mentioned that a coke similarly coloured had been noticed by him some thirty years ago.

Dr. Lessing, in his reply to the discussion, said that he had tried the narrow quartz tube for the crucible in a gas-flame, but found that, owing to the heating being mainly at the bottom, the charge was driven upwards by the evolution of gas, and there was difficulty in obtaining sufficient heating of the sides of the tube. In regard to the insertion of the charge into the hot furnace, this had been tried; but it caused some difficulty with the evolution of the tar, and as a standard method he had preferred starting from the cold. The latter method perhaps might be taken as corresponding to the conditions of carbonization in continuous retorts; and the method of starting with the furnace hot, to carbonization in intermittent retorts. For similar reasons, it had not been found useful to apply pressure to the charge, and working in a vacuum did not correspond so closely to practical conditions.

THE TECHNIQUE OF GAS MANUFACTURE.

By Alfred E. Forstall.

[A Lecture delivered at the Celebration of the Centenary of the Introduction of Gas as an Illuminant.]

Until the seventeenth century, the store of human knowledge as to the aëriform substances, which are now named gases, was practically confined to that of the more striking physical properties of the atmosphere and its corroding effect upon metals, especially when they were heated.

The Origin of the Word "Gas."

Van Helmont (1577 to 1674) was probably the first to understand the existence of aëriform bodies distinct from ordinary air. These he called spirit; and in his writings he mentions bodies almost entirely composed of spirit, which was fixed and solidified in them. To this spirit he gave the name of "gaz." According to Priestley, Van Helmont derived this name from the German word "geist," meaning spirit; but a later writer claims to have found a statement of Van Helmont connecting the word with "chaos."

Apparently the first published assertion as to the composition of the atmosphere was made in 1665 by Hooke, who stated that air contains a principle similar to, if not identical with, that of nitre. He also seems to have recognized that only a certain portion of the atmosphere is required to support combustion and respiration. The precise experiments on respiration published by Mayow in 1670 greatly strengthened this conception of the complex nature of the atmosphere. But in spite of the incontestable facts he presented, this truth was not fully recognized until more than a century afterwards.

Boyle extended the knowledge of the physical and chemical constitution of air by the work described in his treatises published between 1672 and 1692. About 1770, Rutherford demonstrated the existence in the atmosphere of nitrogen. Shortly afterwards, Priestley separated oxygen from red oxide of mercury; and the significance of this discovery, in relation to the constitution of air, was clearly demonstrated by Lavoisier, who, by heating mercury in contact with a measured volume of air, showed that about one-fifth of this volume was taken up with the formation of the red oxide of mercury, and that the remaining four-fifths had all the properties of the "mephitic air" or nitrogen of Rutherford.

Hydrogen was recognized as an individual gas by Cavendish in 1766; and its name was given to it by Lavoisier.

During the seventeenth century, some progress was made in determining the identity of carbon dioxide as distinct from atmospheric air, and in recognizing its various occurrences as the result of fermentation and combustion and as collected in subterranean and enclosed places at a low level, and as the cause of the sudden deaths known to occur in such places but previously ascribed to the acts of an evil spirit. Van Helmont is stated by some authorities to have known the identity of the gases from these sources; but according to others, these facts were not fully known until nearly the end of the eighteenth century. The composition of carbon dioxide was finally determined by Lavoisier.

The existence of fire-damp—the name being obtained from the fact that this "damp" or vapour was inflammable—in connection with marshes and coal seams had been known at an earlier date. Thomas Shirley seems, however, to have been the first Englishman to examine carefully the properties of this important constituent of illuminating gas—now known chemically as methane, and generally as marsh gas, or carburetted hydrogen. In 1667, he published, in the "Philosophical Transactions," an account of his investigation in 1659 of the phenomena occurring in a burning spring near Wigan, in Lancashire. Shirley demonstrated that the combustible matter was a gas bubbling through the water, which gas he collected from the ground after the water had been diverted into another channel. After this publication, many similar observations were made as to the formation of methane by the decomposition of vegetable matter.

One of the earliest observers of the fact that the distillation of carbonaceous matter yielded a combustible gas, was Boyle, who found that, when distilled, wood yielded oil, spirit, phlegm (steam), and water. The Rev. John Clayton, in a letter written to Boyle, and which, although only published in the "Philosophical Transactions" in 1739, must have been written before Boyle's death in 1691, describes experiments in distilling coal, undertaken as a result of seeing gas escaping from a ditch near Wigan, which was found to be underlain by coal. He used a retort, and obtained, first, phlegm (steam), then black oil, and then a "spirit," which could not be condensed, and gradually accumulated until the pressure forced the lute and broke his glasses. The accidental ignition of the escaping gas proved that it was inflammable. By storing some of the gas in bladders, he found that both it and its property of inflammability were permanent.

In 1726, Dr. Stephen Hales distilled wood and coal, and noted the toxic effect upon animals of the "air" produced. He states that from Newcastle coal he obtained one-third of its weight of "air." But since this coal, even with improved methods of distillation, yields only a fifth of its weight of permanent gas, some condensable products must have been included in this amount.

In 1767, Dr. Watson published some essays, in which he speaks of the giving off of "air" during the distillation of coal. Even at this comparatively late date, gases were thus spoken of as "air;" and although the name "gas" suggested by Van Helmont for these bodies was defined in Macquer's Chemical Dictionary, published in 1771, as the "name given by chemists to invisible parts which escape from certain bodies," this name was not used generally until some time after it was adopted by Lavoisier in 1786.

The Early History of the Utilization of Gas for Illumination.

The discovery that the distillation of coal and other carbonaceous substances produced an inflammable and more or less luminous gas was thus made prior to 1690; but it was not until nearly a hundred years later that the idea of using this gas for illuminating purposes was conceived. Then this use seems to have been thought of independently by several persons in different countries at about the same time. Consequently, there is a dispute as to who should be accredited as having been the originator of the use of coal gas as an illuminant.

Apparently J. P. Minckelers, a Professor in the University of Louvain, in Belgium, in 1784 distilled powdered coal for the production of inflammable air, which he used to fill balloons. In a report advocating the use of coal gas for aëronautical purposes, in which he was particularly interested, he is said to have mentioned the fact that the gas might be purified by being passed through lime water, and could then be used for illuminating purposes. It is also claimed that records in the archives of Louvain show that, in 1785, Minckelers lighted his lecture room with inflammable air produced by the distillation of coal.

Phillippe Lebon distilled wood and coal in 1786, and in 1799 took out a patent for "a new method of employing fuel with greater utility, either for heating or lighting, and to obtain certain products therefrom." The apparatus described in this patent was not very practicable; and in 1801 he obtained a certificate of additions. In this certificate, he calls the apparatus a "thermolampe." Apparently his main idea was to obtain inflammable gas with the object of producing motive power by means of its explosion; and little importance was attached to the gas as a means of lighting. For lighting purposes, he described a means of consuming the gas inside a glass globe, into which gas and air were led by separate pipes, and from which the products of combustion escaped by a third pipe. Such a complicated apparatus was not suitable for ordinary use; but his exhibition of lighting by this method, given in Paris in 1802, was written-up in glowing terms by the Parisian newspapers, and in this way attracted attention all over the Continent of Europe.

The earliest patent taken out in England in connection with the distillation of coal was that of Lord Dundonald, for the production of different substances from the distillation of coal, obtained in 1785. His object, however, was the production of tar; and while he is said to have lighted the hall of Culross Abbey with crude coal gas in 1787, he apparently did nothing further along the lines of illumination by means of coal gas.

William Murdoch, who is accredited in Great Britain and among English speaking countries as being the originator of the use of gas for illuminating purposes, apparently began experimenting along this line at Redruth, Cornwall, in 1792. In that year he distilled coal, peat, wood, and other carbonaceous bodies; and being impressed by the quantities of gas given off during the distillation and the facility with which a brilliant light was produced by this means, he made experiments to determine the relative costs of light so obtained and that obtained from oils and tallow. In 1797, he lighted his own premises in Old Cumnock, Ayrshire, with coal gas. Becoming connected with the firm of Boulton and Watt, quite prominently identified with the development of the steam-engine, he lighted with coal gas, in 1789, one of the principal buildings of their plant at Soho, Birmingham; and in 1802, in celebration of the Peace of Amiens, the Soho works were strikingly, and for the period brilliantly, illuminated by coal gas.

Apparently Minckelers and Lebon, while working with other objects in view, preceded Murdoch in their experiments with, and demonstrations of, illumination by means of coal gas; but the latter was the first to work with illumination as the main object. Through Lebon, however, the man who probably was the greatest factor of all in hastening the introduction of the public supply of gas became interested in the subject. This man, Frederick A. Winsor, seeing, in one of the European newspapers, a description of Lebon's exhibition, was struck by the possibilities of the process; and, going at once to Paris, saw the light, and tried to obtain from Lebon information as to the method of producing it. It was, however, impossible for him to pay the high price asked; and Winsor left Paris disappointed, but determined to find out the causes of such important effects and results.

By the following year he had obtained a certain amount of knowledge on the subject, and gave, in Brunswick, exhibitions of the lighting effect of gas produced by the distillation of wood. At this time he was seized with great force with the idea that England was the most favourable field for the exploitation of the process. Acting promptly on this thought, he went to London, and there gave, in 1804, at the Lyceum Theatre, lectures and exhibitions on gas lighting. Although working under difficulties, and at first without much success, partly because of his extravagant claims, Winsor persisted in his efforts to promote and finance a National Light and Heat Company. He was finally reported to have obtained nearly £50,000, all of which was expended in the

furtherance of his plans. In 1809, he lighted with gas a portion of one side of Pall Mall; this being the first public street lighted by means of coal gas.

While Winsor was thus working to interest capital in a company to exploit gas lighting over the whole area of Great Britain, attention was also being called to this means of lighting by the lectures of various chemists; and practical applications of the process were being made in various cotton mills by Murdoch, and by Samuel Clegg. Even with the crude apparatus employed, lighting by coal gas was found to be much cheaper and more brilliant than that obtained, according to the general practice of the day, by the use of candles.

The Inception of the London Chartered Company.

In 1809, Winsor and his associates applied to Parliament for a Charter for a company to supply gas over the whole of Great Britain. Murdoch, who claimed that priority of invention entitled him to the Charter if any were granted, opposed this application; and it was denied. Another application, made in 1810 by Winsor and his associates, resulted in the passing of an Act authorizing the King to grant, within three years, to the London and Westminster Chartered Gaslight and Coke Company, a Charter covering London, Westminster, Southwark, and the adjacent suburbs. The capital was fixed at £200,000, to be raised in full within three years after the granting of the Charter; while £100,000 had to be raised before the Company could commence operations.

The Company finally obtained their Charter on April 30, 1812. Their operations were not successful at first. In 1813, however, progress began to be made; and by 1815, the Company had installed three manufacturing plants and fifteen miles of street mains. Other companies were soon organized; and the business of supplying gas progressed so rapidly in Great Britain that by 1829 more than 200 gas companies had been formed.

The First Use of Gas in the United States.

The first use of coal gas as an illuminant in the United States is said to have been made in Philadelphia in 1796; but the first definite record of its use in this country is the lighting, in 1806, by David Melville of his house in Newport (R.I.), with gas made by himself. In 1810, he obtained a patent for "a gas-lamp for lighting manufactories, mills, theatres, &c, with hydrogen gas, or inflammable air produced from pit coal;" and in 1813 he lighted with gas some mills in the vicinity of Newport. The first gas company in the United States was organized in Baltimore in 1817. This was followed by the organization of companies in Boston and New York. Owing to the comparative cheapness of other illuminants, however, progress was slow; and up to 1830 these were the only cities that had gas-works.

Early Manufacturing Apparatus.

I have been unable to find any description of manufacturing apparatus specifically stated to be that employed in the first works of the Chartered Gaslight and Coke Company. It is probable, however, that the apparatus described in "A Practical Treatise on Gas Light," published by Frederick Accum in 1815, as being calculated for lighting towns or large districts of streets and houses, is, even if not exactly the same, very similar to that which was installed in these works, because Accum was the first Engineer of the Chartered Company, and refers throughout this book to information obtained from Samuel Clegg—his successor.

In this apparatus, the coal was distilled in cast-iron retorts about 15 inches in diameter and 3 or 4 feet long, placed in sets of two in the flues of fire-places built under the backs of the retorts, in which coal-fires were maintained. The fronts of the retorts opened into a chamber shut off from the operating floor by means of a brick wall, through openings in which the work of drawing and charging was done—the coke falling, as it was drawn, through a hole in the bottom of this chamber into a space below the operating floor. The gas leaving the retorts passed through so-called syphon tubes, with a diameter of probably less than 3 inches, into the horizontal condenser or hydraulic main. The lower end of the syphon tube, or of the dip-pipe, was sealed by the accumulation of the liquids condensed from the gas in the hydraulic main until they passed off over the top edge of a partition plate set at a level above that of the bottom of the syphon tube. From this condenser the gas was carried by a take-off pipe to a pipe coil placed in the water in the space between the holder and the tank. After being cooled in this coil, the gas was led into a lime machine; while the condensed liquids ran into a tar-cistern. In the lime machine the gas was caused to bubble through lime water, by which the sulphur compounds were removed. Upon leaving the lime machine, the gas was passed through a small washing apparatus, placed inside of the holder, from which it escaped into the interior of the latter.

The holder bell probably had a capacity of about 14,000 cubic feet, and was made of light sheet iron fastened to a rectangular frame formed of wooden struts and iron bars; while the tank was apparently made by lining with wrought-iron the foundation walls of the building in which the holder was enclosed.

The street mains were made of cast-iron spigot-and-faucet, or bell-and spigot-pipes; the joints being made with either iron cement or lead.

Service-pipes, up to a diameter of 1¼ inches, were made of tubes of welded wrought iron in 3-feet lengths, with wrought-iron fittings and screwed joints.

For house piping, tubing made either of sheet-iron b.azed, of lead, or of copper with lap-over joints was used. Copper with brass fittings was recommended by Peckston for interior work, with wrought-iron tubing for all pipes exposed to the weather, The burners were cockspur, consisting of three round jets, a single round jet, batswing, or argand.

The Introduction of the Gas-Meter.

In the 1819 edition of Peckston's "Theory and Practice of Gas Lighting," it is stated that the general mode of charging customers for light was at a certain sum per annum for burners of given dimensions burning from sunset until a stipulated hour, but that this was not satisfactory, and that meters for measuring the actual amount of gas used were being gradually introduced—a suitable meter having been brought out in 1817.

Carbonizing Plant.

In a modern coal-gas plant the retorts in which the coal is carbonized are made of clay, Ω-shaped, with a height of about 16 inches, a width of 24 to 28 inches, and a length of 9 to 10 feet for single retorts, or from 11 to 20 feet for through retorts. They are set in groups of from six to twelve, each group or bench being heated by means of a generator furnace equipped with recuperators. As a rule, the long axis of the retort is horizontal; but that of through retorts is sometimes inclined about 32° from the horizontal. During the last five years, the practice of having this axis vertical has been quite largely adopted. In smaller works, the coal is charged into, and the coke drawn from, the retorts by hand, but in larger works these operations are performed by machinery. The stand, bridge, and dip pipes, through which the gas passes from the retorts to the hydraulic main, have a diameter of 7 or 8 inches. Excepting for details of construction adopted to insure the sealing of the dip-pipes in ammoniacal liquor, the hydraulic main remains much as in the early works.

The amount of apparatus between the hydraulic main and the holder has been greatly increased from that in the original plants, in order that the removal of tar, the cooling of the gas, and the removal of ammonia and of the sulphur compounds may all be efficiently effected.

In the United States, the first piece of this apparatus is often a primary condenser, or cooling vessel, employing air as the cooling medium. Either following this condenser or being itself first in the series is an exhauster or gas-pump, which relieves the retorts of the pressure thrown by the holders and the friction developed as the gas passes through the apparatus between the exhauster and the holder. From the exhauster the gas passes into a frictional tar-extractor, then to the secondary condensers, which are usually water-cooled, and then to the washers or scrubbers, for the removal of ammonia by solution in water—a washer being a vessel in which the gas is caused to pass through water in small bubbles, while a scrubber is one in which the gas passes in thin streams over surfaces kept wet with water. Leaving the scrubbers the gas goes to the purifiers, where it is freed from sulphuretted hydrogen by means of the chemical affinity between this substance and the oxide of iron, which forms the active portion of the purifying material customarily used. After passing the purifiers, the gas is measured by large wet meters, and then passes to the holders, which, except in the smallest plants, are made with more than one lift, and for large plants vary in capacity from 1,000,000 cubic feet to the 15,000,000 cubic feet of the largest holder in the world—that at the works of the Astoria (L.I.) Light, Heat, and Power Company. In some of the larger works, rotary scrubbers for the removal of cyanogen and naphthalene are also provided.

Retorts and Furnaces.

The change from the simple plant described in Accum's treatise to the more complete modern one was made gradually, as knowledge was gained concerning the principles involved in the distillation of coal and the subsequent treatment of the volatile products of distillation. These principles are treated of later.

About 1850, clay retorts began to replace iron ones, because of their ability to withstand a much higher temperature, and so make possible a much larger production of gas from a given quantity of coal. The temperature to which the retorts could be heated was increased, and economy of fuel obtained by improvements in the design of the furnaces and in the method of setting the retorts. The greatest advance, however, in securing both intensity of heat and economy of fuel, came with the introduction of generator firing and the preheating of the air used for combustion by means of the heat contained in the waste gases passing to the chimney. While one of the earliest experiments with gaseous firing for heating retorts was made in 1862, when a Siemens regenerative furnace was used for the purpose at one of the gas-works in London, this method of heating was developed on the Continent of Europe. The Siemens furnace was too elaborate for general use. Simpler generators and recuperators were, however, soon devised, and by 1874 had been adopted in about twenty works. After that time, the progress was rapid on the Continent. But up to 1878 there was practically no gaseous firing in either England or the United States. In that year, Dietrich furnaces were installed in one of the gas-works in Baltimore; and experiments (apparently not very successful) were made in several places with other furnaces. Success was obtained in the early eighties; and after 1885 the use of generator furnaces and recuperators became general in the larger coal-gas plants,

Exhausters.

The exhauster, first introduced in 1841, came into general use at the same time as clay retorts. Its use is required because a high pressure on the hydraulic main, coupled with the bubbling of the gas through the hydraulic seal on the dip-pipes, produces in the retorts great fluctuations in pressure, and a consequent pulsation of the gas passing off from the coal, which increases very greatly the extent of its contact with the hot walls of the retorts and the destructive breaking-down of valuable hydrocarbons by reason of this contact.

Condensers.

The change from the condensing coil placed in the gasholder tank to the form consisting of vertical pipes connected at the top in pairs by return bends and at the bottom into a cast-iron box with suitable partitions, came before 1841. This form, while still commonly used in Great Britain, has been superseded in the United States by condensers in which the gas passes through an enclosed space traversed by tubes or pipes; the cooling medium being either water or air flowing through these tubes.

Washers and Scrubbers.

It is uncertain when washers and scrubbers were first introduced for the purpose of absorbing ammonia. Washers, apparently placed ahead of the condensers, were used at some works before 1841; but they were tar-extractors rather than ammonia extractors. By 1853, tower scrubbers, filled with coke, were being used; but they also seem to have been intended more for the removal of tar than for ammonia. By 1868, however, the use of tower scrubbers for the removal of ammonia from the gas before it entered the purifiers seems to have been thoroughly established. Rotary scrubbers were introduced shortly after 1880, and have been adopted in the larger plants.

Purification—The Station Meter.

The change from wet to dry methods for the removal of sulphuretted hydrogen and other sulphur compounds, advocated as early as 1817, had not become general in 1841; but the use of dry lime was generally adopted soon after that year. From 1850 onwards, the use of oxide of iron as a purifying material became quite common; and in recent years it has been almost the only material employed for this purpose. The use of station meters began soon after 1815.

Gasholders.

The increase in the amount of gas sold, and the difficulty of securing ground space in the crowded neighbourhoods in which the early gas-works were built, gradually led to the use of holders of more than one lift; and the capabilities of the older methods of guiding holders—that is, of providing against their being upset—were soon outgrown. At first, holders were guided either by the sliding along a central post of an open pipe with its lower end sealed in water or by means of chains attached at different points around the circumference of the crown and led over grooved wheels to be fastened to a single weight, which descended as the holder was raised. Later, the guiding was by means of wheels or rollers fastened at points equally distant around the outer edge of the crown and the bottom curb, and working against rails or plates attached to the tank wall and to columns, each composed at first either of a single cast-iron cylinder or, in some cases, of groups of cast-iron columns joined together by struts, and, later, of a single wrought-iron cylinder—the columns, whatever their form of construction, being joined at the top by means of wrought-iron girders. The latest style of guide-framing, which came in use with the adoption of holders of more than two lifts, consists of structural steel columns joined to each other by several series of horizontal struts and diagonal ties in such a way that the whole of the frame may be considered as forming a rigid cylindrical cantilever.

About the same time that the modern system of guide-framing was adopted, the use of steel tanks, built largely above ground, in place of the brick tanks built below the level of the ground, also began to come largely into use in the United States.

Coke-Oven Gas.

Until recently, the comparatively small retorts employed in gas-works formed the sole source of coal gas; but now the bye-product or retort coke-oven, used in the manufacture of coke, also affords a supply of such gas for illuminating purposes. When first introduced, all the gas produced by these ovens was consumed in the plant itself; but shortly after 1896, the sale of surplus gas for illuminating and heating purposes was begun in Glassport (Pa.). In 1899, this sale, on a large scale, was entered into by the New England Gas and Coke Company, with a plant at Everett (Mass.), supplying gas to Boston and its suburbs. Since that time other plants have entered this field, until there are now eleven coke-oven plants selling illuminating gas in the United States.

When the surplus gas is to be sold, two separate sets of hydraulic mains and of condensing and scrubbing apparatus are provided—one handling the rich gas made during the early, and the other the poorer gas made during the latter, part of the charge. The rich gas is distributed; while the poorer gas, after being freed from ammonia, tar, and benzol, is used for heating the ovens. In one or two plants the ovens are heated with producer gas made from part of the coke; all the coal gas being sold.

Apart from the use of retort-ovens, instead of retorts, the treatment in a coke-oven plant of the gas which is to be sold does not differ materially from that in an ordinary coal-gas plant. The advantages claimed for coke-ovens as producers of coal gas are low labour costs, because of the large weights of coal used in one charge, and the production of a quality of coke which in many localities commands a better market than does ordinary gas coke.

Carburetted Water Gas.

While in Europe the carbonization of coal furnished up to about 1894 practically the sole source of illuminating gas, and is still by far the largest source of such gas, in the United States it is second in this field to carburetted water gas. The latter gas is produced by mixing with non-luminous water gas a sufficient amount of oil gas to give the mixture the desired illuminating value. The decomposition of steam by means of highly-heated carbon, with the formation of water gas, was known before the coming into use of coal gas, and was experimented upon by Fontana in 1780. After the introduction of coal gas, efforts to carburet water gas were begun; and in 1847 a patent was taken out in England by Stephen White for the production of combined coal and water gas. The process covered by this patent was widely discussed by gas engineers of that time, and favourably regarded by some of them; but it proved to be incapable of control, and therefore to give very variable results, and was not a commercial success. Other processes for the production of carburetted water gas were presented; but none of them were successful until, in the early seventies, Mr. T. S. C. Lowe devised, in this country, the apparatus which, although greatly modified and much improved by other men, still bears his name. The success of this apparatus is due to the principle, first employed in it, of the internal heating of the vessels required for the manufacture of the oil gas needed to carburet water gas by the combustion in them of the combustible portion of the producer gas formed while the fuel in the water-gas generator is being brought up to the temperature necessary for the decomposition of steam.

The Lowe apparatus—in which water gas and oil gas are made practically in one operation, while the conditions suitable for the manufacture of each can be separately obtained and controlled, in connection with the supply of cheap and suitable carburetting materials afforded by the large production of petroleum and its distillates—made the manufacture of carburetted water gas commercially practicable and economical in the United States; and after the installation of the first apparatus in Pennsylvania, in 1873, it was rapidly adopted, until at the present time it furnishes slightly more than two-thirds of the total amount of illuminating gas made and sold in the country.

The generating apparatus employed in the manufacture of this gas consists of three suitably connected cylindrical vessels constructed of steel plates and lined with fire-clay blocks. The first vessel, called the generator, contains the fuel, and furnishes both the producer gas and the water gas required. The other two vessels, in which the oil gas is made, are called respectively the carburettor and superheater, and are filled with fire-brick piled in rows from 2 to 3 inches apart; the rows in one tier being at right angles to those in the tiers next above and below. The necessary blast, steam, and oil connections are provided; and at the top of the superheater is a take-off pipe, with its lower end sealed in water in an auxiliary vessel, and having an opening to the atmosphere which can be closed by a self-sealing lid.

A fire having been started in the generator, it is gradually filled with coal or coke; and this fuel is brought up to a state of incandescence by air blown in under pressure. Because of the deep fuel bed, producer gas is formed, the combustion of which in the carburettor and superheater heats the chequer-brick in these vessels to the temperature required for the gasification of the oil. When the proper temperature has been reached in all three vessels, the blast is shut off, and the opening into the air from the take-off on the superheater is closed. Steam is admitted to the generator, and, passing through the fire, is decomposed by the combination of its oxygen with the hot carbon. The gas thus formed, consisting principally of carbon monoxide and hydrogen, passes to the carburettor. Oil sprayed in at the top of this vessel is vaporized by the heat; and the vapours travel with the water gas through the carburettor and superheater—being converted during this travel into a permanent oil gas. The carburetted water gas thus produced must be cooled and purified as in the case of coal gas, except that, since it contains practically no ammonia, it is not necessary to pass it through apparatus for the removal of this substance.

In the larger gas-works, the manufacture of both coal gas and carburetted water gas in conjunction is advantageous. The fluctuations in demand, and the seasonal peak requirements, can be cared for much more economically with a carburetted water-gas plant than with a coal-gas plant, because of the smaller investment required by the former for a given generating capacity and the greater ease and economy with which it can be put into, and taken out of, action. In many cases it has been found that, even when the cost of carburetted water gas is greater, the cost of a properly proportioned mixture of the two will be less than the average cost of coal gas alone.

A combination plant has the advantage of giving the company possessing it a better control of the market for coke—the main residual of coal gas manufacture—and placing it in a position to take advantage of fluctuations in the prices of coal and of petroleum, because of its ability to vary the amount of gas made from either of these raw materials. Owing to these advantages of the combination plant, almost all of the companies in the United

States manufacturing more than 50,000,000 cubic feet of gas per year make both coal gas and carburetted water gas.

Oil Gas.

For many years gas had been made by the distillation, in retorts, of petroleum and other hydrocarbon oils, such as the Scotch shale oils. But this gas was used only for such special purposes as the lighting of railway cars or the enrichment of coal gas; the quantity so employed forming but a small proportion of the total amount of gas distributed. In California, however, the high price of all carbonaceous materials except petroleum led, about the year 1900, to experiments which resulted in the development of a process by means of which is made, from crude petroleum, or one of its heavier distillates, as the sole raw material, a gas similar in its composition to coal gas, but very different from that produced, by distilling oil in retorts.

The generating apparatus employed in making this gas is similar to that employed in the manufacture of carburetted water gas, and consists of two cylindrical steel shells lined with fire-clay blocks and filled with chequer-brick. The heat required for the gasification of the oil is obtained by the combustion, by means of air supplied under pressure at suitable points, of oil sprayed in through burners placed around the circumference of the primary generator near its top. When the proper temperature has been reached, the blast-valves and the stack-valve at the top of the secondary generator are closed, the supply of oil through the heating burners is stopped, and oil is sprayed in through other burners at the top of the primary generator, and also at either the bottom or at the top of the secondary generator. Because of the large amount of contact with the highly-heated surfaces of the chequer-brick to which the oil vapours and gas first produced are exposed, from 20 to 25 lbs. of carbon, in the form of lampblack, are set free per 1000 cubic feet of gas made; and the handling and disposal of this carbon, which is used as boiler fuel or as the generator fuel for the manufacture of carburetted water gas to be mixed with the oil gas, and, in some places, is made into briquettes and sold for fuel purposes, is a problem closely connected with this process.

This method of manufacturing gas requires the use of from 10 to 14 gallons of oil per 1000 cubic feet, compared with about 4 to 5 gallons of oil per 1000 cubic feet of carburetted water gas. It is therefore economical only where the cost of the extra 6 to 9 gallons of oil is less than that of the 30 to 50 lbs. of coal which would be required for making the water-gas portion of the carburetted water gas.

Wood Gas.

Another source of illuminating gas which has been availed of to some extent both in the United States and in Germany is the distillation of wood. Wood gas was made in the Philadelphia Gas-Works continuously from 1854 to 1864, and during several years of this period formed about 5 per cent. of the total amount of gas produced. It was also the only gas that could be manufactured in several southern cities during the Civil War. In these instances, it was made as a substitute for coal gas; the wood being distilled in retorts similar to those used for distilling coal.

At the works of the Mutual Gaslight Company, in New York City, wood gas was made from 1879 to 1884 as a substitute for water gas. The wood was distilled in L-shaped retorts, so charged that gas given off in one part of the retort passed through a mass of heated charcoal in another part. This produced a non-luminous gas, which was carburetted with oil gas. A similar retort and method of operation is used in the Riche process, recently patented in France. This plant, however, is claimed to produce gas of a fair illuminating value. At present, wood gas is being distributed in a small town in Washington; but, apart from special local conditions, it cannot be produced as cheaply as other gases.

Blue Water Gas.

As a result of a wide-spread belief that there was a market for a fuel gas of lower calorific value and cheaper cost than ordinary illuminating gas, attempts were made, between the years 1880 and 1896, in twenty-seven different towns in the United States, to distribute either blue water gas or water gas partially enriched with oil gas to give it greater calorific value. The calorific value of the gas so distributed ranged from about 300 B.Th.U. per cubic foot for the blue water gas to as high as 450 B.Th.U. for the partially enriched gas. Many of these attempts were made after the introduction of incandescent gas lights; so that the gas could be used, and its use was advocated, for lighting as well as for fuel purposes. But in no instance was the effort to sell such a gas commercially successful; and the companies undertaking it soon went out of business, or turned to the manufacture of illuminating gas. This result was reached even in the few instances where this fuel gas, being the only gas supplied in the locality, did not have to compete with any other form of gas.

These attempts to distribute fuel gas of a comparatively low calorific value failed because the cost of a given number of heat units could not be made sufficiently lower than that of the same number derived from a gas of a higher heating and illuminating value to counterbalance the disadvantages of having to consume larger quantities of gas and take a much longer time to do the same amount of work.

"Mond" Gas.

No attempt to distribute gas of low calorific value has been made in the United States since 1897; but there is in England a Company which was organized about six or seven years ago for the purpose of supplying to a populous manufacturing district "Mond" gas for use by large consumers for power and fuel purposes. This is a producer gas made by passing through a bed of incandescent fuel air mixed with as much steam as it is possible to use without reducing the temperature of the fire below the point at which the decomposition of the steam with formation of water gas will take place. It contains about 40 per cent. of combustible matter mixed with a total of 60 per cent. of nitrogen and carbon dioxide, and has a calorific value of about 156 B.Th.U. per cubic foot. The use of the great amount of steam leads to the formation of large quantities of ammonia; and the recovery and sale, as a residual, of this ammonia is one of the principal features of the process, which can only be used on a large scale. It was thought that the recovery of the ammonia and the large-scale working would make it possible to sell the gas at a price at which it would be attractive to users of fuel and at the same time pay a good return on the investment. As late as two years ago, however, the annual report of the Company showed that the operating expenses had been barely met, and that nothing was being earned upon the investment. The low cost of manufacture, and the comparatively small investment in manufacturing apparatus, seem to make it impossible to meet the relatively larger distribution costs and investment and compete with isolated plants.

[Analyses of some of the various kinds of gases mentioned above are given in the appendix.]

Destructive Distillation of Carbonaceous Bodies.

The problem of the destructive distillation of carbonaceous bodies for the production of gas for illuminating and heating purposes has two distinct divisions—the first being the proper application of heat to the material, in order to secure the greatest possible quantity of gaseous products of good quality; and the second the proper treatment of the volatile portions of the products of distillation, in order to conserve in the gas the greatest possible amount of light and heat-giving bodies.

The determination of what constitutes the best possible heat treatment to apply to the raw material is rendered difficult by the complex nature of the reactions which take place when coal or any other material consisting largely of carbon and hydrogen is heated to a high temperature without any access of air. A clear knowledge of the character of, and the effect of heat upon, the substance called hydrocarbons is requisite for the successful solution of the problem. The hydrocarbons with which the manufacturer of coal gas is concerned belong to five groups; each group consisting of a number of substances which resemble each other in composition but with varying densities and boiling points. These groups are the paraffins, with a composition represented by the formula C_nH_{2n+2}; the olefines, with a formula of C_nH_{2n}; the acetylenes, with a formula of C_nH_{2n-2}; the benzene series, with a formula of C_nH_{2n-6}; and naphthalene.

In the paraffin group, the affinities of the carbon atoms are fully met by the hydrogen atoms. Consequently, they are known as saturated hydrocarbons, and are more inert than the members of the other groups in which the affinity of the carbon is not so fully satisfied by the hydrogen contained in them. In each group the bodies containing the smaller number of carbon atoms in the molecule have the lower densities and boiling points. The lower members of the paraffin, olefine, and acetylene series are all gases; while the higher members of these series, and all of the benzene series and naphthalene, are vapours at ordinary temperatures and pressures.

The exposure of hydrocarbons to heat produces changes in composition which, in general, consist of a splitting-off of hydrogen atoms, and result in the formation of hydrogen and hydrocarbons simpler than the ones acted upon. The exact nature of these changes depends, however, upon the character of the hydrocarbons and the nature and intensity of the heat to which they are exposed. It is probable that the first products of the heat action are complex hydrocarbons, largely paraffins of high density and boiling point; and that, during their passage through the retort, these, by further exposure to heat, are broken-down into hydrogen and simpler hydrocarbons. The primary products are either liquids or vapours at ordinary temperatures, and, consequently, little gas would be formed if they were permitted to remain in their original condition. On the other hand, excessive exposure to heat, and especially to contact with highly-heated surfaces, produces secondary reactions, resulting finally in the formation of a gas consisting largely of hydrogen, through which are diffused hydrocarbon vapours, most of which will be condensed at temperatures and at pressures frequently met with during the distribution of gas, and the setting free of carbon, which causes much trouble in the generating apparatus. The problem, therefore, is so to adjust the conditions under which the secondary reactions occur as to secure the proper amount of breaking-down, while avoiding anything in excess of this amount.

Starting with a given amount of carbon and hydrogen in the raw material, the heat treatment to which the material should be subjected to obtain any desired character of gas depends upon the following principles: The radiant heat tends to split up the complex paraffins into simpler paraffins and olefines; and if exposure to such heat is continued a sufficient length of time at a sufficiently high temperature, the final result is the decomposition of the complex bodies into methane, the lowest of the paraffin series which is not affected by radiant heat, and several of the lower members of the olefine series. On the other hand, heat communi-

cated by surface contact tends to produce from a paraffin hydrogen and hydrocarbons of the benzene group. In each case the action is accelerated and intensified by increasing the temperature of the radiant, or contact, surfaces.

The mixture of olefines and methane has a larger volume and a higher illuminating value than the original paraffins, but is exceeded in both respects by the mixture of hydrogen and benzene vapour. The latter mixture will not, however, contain sufficient hydrogen or other permanent gas to carry the vapour at the ordinary temperatures, unless some of the carbon originally present is set free and lost so far as the the resulting gas is concerned. Therefore, when a hydrocarbon gas is to be employed alone, as in the case of the manufacture of coal gas, or is even to be used to enrich another hydrocarbon gas, and illuminating or calorific value is of importance, the gas and vapours escaping from the coal or other material being distilled should be exposed to the action of radiant heat at not too high a temperature, but should be protected from contact with highly-heated surfaces. When, as in the case of the manufacture of carburetted water gas, the hydrocarbon gas is to be used for the enrichment of a mixture of simple gases, which can carry comparatively large amounts of hydrocarbon vapours, contact with heated surfaces produces good results, especially when the hydrocarbons are exposed to such heat action while being carried by the simple gas, since the presence of the gas arrests the action before it reaches the point at which carbon is set free.

There is no such protecting and carrying gas present in the manufacture of oil gas as carried on along the Pacific Coast. Consequently, in this process the contact of the hydrocarbons with highly-heated surfaces results in the setting free of sufficient carbon to form the hydrogen required to protect the remaining methane and uncombined olefines and carry the vapours of the benzene group. The setting free of a certain amount of carbon, and its recovery in the form of lamp-black, is therefore an inherent feature of this process, whatever the character of the oil used as the raw material. Even when no importance is attached to illuminating value, the calorific value of the gas derived from a given quantity of material will be greater the smaller the amount of carbon set free; and since methane (one of the most important constituents of coal gas viewed from a calorific standpoint) is not effected by radiant heat, but is decomposed by contact with hot surfaces, especially at temperatures of about 600° C. (1112° Fahr.), it is still important, when making a hydrocarbon gas by itself, to subject the gas only to the section of radiant heat, and avoid, so far as possible, contact with highly-heated surfaces.

Modern Carbonizing Conditions.

Practice in carbonization in gas-works had gradually come to agree with these principles, even before they were thoroughly understood. Early in the manufactnre of coal gas, it was recognized that better results, so far as the production of gas was concerned, were obtained when coal was carbonized in thin layers and at comparatively high temperatures. In working along these lines, however, the portion of the walls of the retort above the charge of coal afforded a large amount of hot surface in proportion to the amount of gas being made; and as the temperature at which carbonization was carried on was increased, considerable trouble was experienced from the free carbon produced by the action of the heated surface. To avoid this trouble, it was found necessary to increase the weight of the charges placed in a given size of retort, and lengthen the time during which the carbonization of the charge lasted, until, finally, as a result of experience with intermittently charged vertical retorts, it has become the practice to fill horizontal retorts as completely as possible, and make the duration of the carbonization sufficiently long to drive all of the gas out of these large charges. The gas, however, is still exposed to contact with hot coke during at least portions of the long period of carbonization; and while the use of these large charges has increased both the quantity and the quality of the gas produced from a given weight of coal, the results obtained from them are probably not so good as could be obtained by the carbonization of coal in smaller charges with the proper exposure of the gas to radiant heat of a low intensity.

The use of large charges reduces labour costs; but it is questionable whether a point is not soon reached at which any saving in this direction is more than overcome in a loss in the quantity and quality of the gas made. It is possible that experiments with horizontal retorts of much smaller dimensions than those now used, completely filled with coal, would show sufficiently better gas results to compensate for increased labour costs. The continuously operated vertical retort, into which coal is introduced in small amounts at intervals of a few minutes, and in which it is possible to regulate very closely the extent to which the gas is subjected to radiant heat, seems to offer the best means of solving the problem of securing the proper heat treatment during the distillation of coal.

Even when the best conditions of heat treatment are attained, the gas issuing from the retorts or other generating apparatus is a mechanical mixture, the principal constituents of which are hydrogen, methane, and more complex hydrocarbons—some of the latter being vapours, with smaller amounts of carbon monoxide, carbon dioxide, and various impurities. The second portion of the problem of the manufacture of a hydrocarbon gas is to so treat this mixture that, when the cooling from the high temperature at which it leaves the retort to atmospheric temperatures and the removal of the impurities has been completed, it will retain as large an amount of these hydrocarbon vapours as it is possible to carry to the consumer. The problem of doing this is rendered difficult by the fact that, being the vapours of liquids mutually soluble in each other, the combined tension of these vapours is much below the sum of the vapour tensions of each; and when one of high boiling point is condensed into the liquid form, it will carry down with it some of the others whose boiling points are such that, if left to themselves, they could be retained in the gas. It is, therefore, necessary to effect the cooling of the gas in such a way that the condensing out of the vapours which it is impossible to retain in the gas shall be accompanied by as small a loss as possible of vapours which can be retained.

The problem is further complicated by the fact that the employment of the best method of achieving this result is apt with coal gas to lead to trouble in the distribution system, from the saturation of the gas with naphthalene—a heavy vapour which condenses directly to the solid form, unaccompanied by other vapours which, condensing simultaneously into liquids, would dissolve the naphthalene. It is therefore necessary to compromise and suffer a small loss in one direction in order to avoid trouble in another. On the whole, however, the best treatment consists in the removal of the tar, formed by the condensation of the heavier vapours, while the gas is still at a temperature of above 100° Fahr., and a subsequent gradual cooling of the gas to atmospheric temperatures; the condensed liquids formed at different temperatures being removed before any great further drop in the temperature has taken place.

When the gas has reached atmospheric temperature, it is necessary to remove the ammonia which has not been absorbed by the condensation, during the cooling of the gas, of the aqueous vapour which it contained when it left the hydraulic main. This removal is effected by the use of water. After removal of the ammonia, gas must be treated for the removal of sulphuretted hydrogen; and the reduction of the amount of other sulphur compounds if this latter amount is excessive. The purifying material commonly used in the United States for the purpose has as its active agent hydrated sesquioxide of iron. This combines with sulphuretted hydrogen to form sulphide of iron, which, upon exposure to the atmosphere, is oxidized, with the re-formation of the hydrated ferric oxide and the setting free of sulphur. The efficiency of this portion of the process increases with rise in temperature; and in many gas-works the gas is heated to a temperature of about 100° Fahr. at the inlet of the purifiers.

The purifiers complete the chemical and physical treatment of the gas, which leaves them fit for distribution; but, for economical reasons, it is measured and then passed into storage holders before being sent out.

In the early period of the gas industry, the treatment given to the raw material and the resulting volatile products was largely governed by rule-of-thumb. In recent years, however, all the manufacturing steps have been studied scientifically, and great progress has been made both in knowledge as to principles and in the practical application of this knowledge. Much remains to be investigated; and there is no reason to doubt that the processes now employed will be improved as time goes on, and that the debt of humanity to the gas industry, accumulated during the first century of its existence, will be largely increased during the second.

Appendix.

—	Coal Gas.	Carburetted Water Gas.	Water Gas.	Crude Oil Gas.	Oak Wood Gas.
Candle power	16·7	24·5	..	19·7	26·0
Specific gravity	0·430	0·625	0·53	0·482	0·580
B.Th.U. per cubic foot—					
Observed	..	626·8	316·8	679·9	..
Calculated	659·7	626·7	302·2	..	..

Analysis.

—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Illuminants—					
Unfixed (C_6H_6)	0·80	0·6	..	7·01	6·46
Fixed (C_nH_m)	4·00	11·4	..		
Carbon monoxide (CO)	8·20	31·3	42·8	9·21	26·11
Hydrogen (H_2)	45·20	36·1	50·3	39·78	30·44
Marsh gas (CH_4)	37·40	12·6	0·4	34·64	33·12
Ethane (C_2H_3)	0·70	2·3	..	..	..
Carbon dioxide (CO_2)	1·60	3·0	3·0	2·62	0·48
Oxygen (O_2)	0·30	0·4	0·4	0·16	..
Nitrogen (N_2)	1·80	2·3	3·1	6·58	3·39
	100·00	100·0	100·0	100·00	100·00

A "Golf Circle" in connection with the Southern District Association of Gas Engineers and Managers has recently been formed; and last Thursday week the members met at the Hendon Golf Links—a very enjoyable day being spent. The winner of the medal round was Mr. Arthur Valon, with a score of 86, less 9 handicap—77 net. It is proposed to hold another meeting some time during the month of September next, due notice of which will be given.

SOME NOTES ON FURNACE CONTROL.

By H. D. Madden, of Cardiff.

[A Paper read before the Wales and Monmouthshire District Institution of Gas Engineers and Managers, May 9.]

In placing before you these few notes on the subject of furnace control, I do so at the request of the members of the Council, who felt that this subject would be of interest to representatives from all sizes of gas-works. Whether a unit of only one, two, or forty settings is employed on a works for carbonizing purposes, the retort-house is the centre of interest in each case; and we all endeavour to produce from a given ton of coal the fullest values in gas and residuals.

The make per ton has of late years been enhanced, not through any one big factor, but by careful attention and fine adjustment of every detail that makes up the retort-bench and its mains and connections. The working of the regenerator furnace, with its recuperative flues for the extraction of the waste heat from the spent gases, is so well known that it needs no description; and its economies in flue consumption make it a great factor in gas manufacture as against the earlier forms of furnace firing.

The theoretical thermal efficiency of the coke utilized in gas producer is the standard we should attempt to reach in practical working. Now, 1 lb. of coke will develop approximately 14,000 B.Th.U.; but the whole of this heat is not utilized in heat transmission for carbonizing pure and simple, and its full development is affected by two sources: (1) The conduct of the fuel-bed and producer. (2) Heat losses by radiation and by waste gases. In the case of No. 1, the fuel-bed and its gas-producing efficiency are governed by several important factors.

Conduct of Bed.

The area of the grate is a factor of importance; and the gas producing efficiency of the producer is governed by the following factors: The fuel-bed must be kept uniform in depth; and the furnace must be regularly charged with hot coke and carefully levelled-over to prevent the primary air taking a pathway of the least resistance, with the attendant evils of (1) local clinker, (2) local heating of the furnace and detrimental effect on the fire-brick linings, (3) producing a gas containing a high percentage of carbonic acid, with a consequent loss of heat and fuel. The quality and efficiency of the producer gas are also governed by the adjustment of the primary and secondary air and dampers; and it is important for good working to ensure that the furnace-door has a tight-fitting face, and that the quantity of primary air is under perfect control, and also that a sufficiency of secondary air be given to perfectly consume the producer gas in the combustion chamber.

The length of the carbonic oxide flames and regular heating of the retorts in the setting can be perfectly controlled by the use of the secondary-air slide; and, with good working of the setting, a slight pressure of about 3-10oths of an inch should exist in the top of the oven-arch. This, if maintained, ensures a very slow travel of the combustible gases, and reduces to a minimum the cutting effect on the fire-clay work. A simple way to ascertain this condition is to have a piece of pipe, ½ or ¾ inch in diameter, built into the front wall, which permits a small, feeble violet flame to burn externally, and to be readily visible from the stage floor.

Assuming, however, that a setting has been carefully adjusted, the conditions of the fuel in the furnace vary from one clinkering to another. Directly after clinkering, the fire is free, and too readily takes the primary air until a settlement of the fuel occurs, and a slight clinker starts to form, when normal conditions begin again to prevail, and the primary and secondary air supplies become more perfectly balanced. But during this period of the free-and-easy run of the primary air, the presence of carbonic oxide in the exit-fumes and a diminution in the level of the fuel-bed is noted. This indicates that the producer reactions have been too rapid, and consequently a fuel loss has occurred between the clinkering time and such time as the fire settled to normal conditions. An examination of the fire-level will show that the combustion has been rapid, and the fuel-level lowered accordingly; and an analysis of the producer gases gives a result which shows an additional proportion of carbonic acid, indicating that for a temporary period the primary air has been slightly in excess by reason of the free way in the fuel-bed.

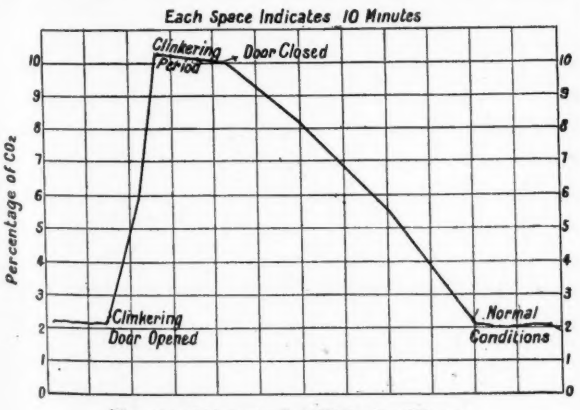


Diagram of Uncontrolled Clinkering Effects.

Percentage of CO_2 in Producer-Arch Top.

This matter has engaged the attention of several engineers; and some years ago a clockwork arrangement was brought out which mechanically reduced the opening of the primary air slide after clinkering times, and gradually opened it until the next period of clinkering—thus controlling the fuel losses during the period after clinkering, and gradually admitting more air as the furnace settled closer on the bars and the clinker began to form over the base of the fire. This apparatus was an ingenious device, but, I believe, could not survive the hardships of the coke-hole—heat and steam, with consequent corrosion, having serious and detrimental effects on its possibilities.

Breeze Control.

About three or four years ago, the writer gave some attention to endeavour to find a means of retarding the extreme activity of the fire directly after clinkering, with the hope that some fuel might be saved. After a series of experiments and observations, I found that a simple and effective way of checking this waste carbonic oxide was by the use of breeze, in the following way: Just previous to cleaning the grate of the furnace and removing the clinker, a blanket of breeze is introduced on the top of the fuel-bed through the furnace charging-door. The fire is then cleaned; and the shaking-up of the fuel, by the removal of the clinker, causes the breeze on top of the coke to work downwards into the mass of incandescent fuel and fill up all the interstices between the individual lumps of coke. This procedure exerts a retarding influence on the otherwise free rush of primary air through the fuel, and controls it until the breeze becomes consumed, by which time the fire has largely settled down into regular working.

The arrangement achieves the following objects:—

1.—A control of the fire and a checking of the furnace gases which would otherwise run to waste, with consequent loss of fuel.
2.—No adjustment or alteration is required to the primary-air slides or the damper to ensure uniform working.
3.—The fierce upward rush of combustible gases into the setting during clinkering times, with its undue temperature effects on the refractory retorts and bricks, is regulated and largely obviated (and is it not permissible to suppose that the setting and retorts are unduly heated for the period directly after uncontrolled clinkering, with a possible decomposing action on the tars and hydrocarbon vapours?)
4.—A new and economical use of breeze is provided, with a further consequent fuel economy.

Heat Losses.

Heat losses may be accounted for in the following ways:—

1.—Loss by radiation.
2.—Heat removed in the ashes and clinker.
3.—Heat carried off by the waste gases.

The loss by radiation may be minimized by constructing the front walls of the setting in hollow form with bonding bricks, and filling the space with some suitable non-conducting material, similar in manner to the old Welsh coke-oven practice for the retention of heat, and in our case for fuel economy. Several gas engineers have introduced this plan into retort-benches; and, if I remember correctly, Mr. S. Meunier, of Stockport, was one of the pioneers in the matter. Minimizing the radiant heat from the front walls of the setting considerably lessens the heats acting on the ascension-pipes, with a consequent reduction of the coking effects on the tars deposited in them. The water in the ash-pan recovers to some extent the heat from falling ashes, and steam is produced, which is reduced to hydrogen and carbonic oxide in its passage through the fuel-beds. Heat contained in the removed ashes during clinkering times is, of course, irrecoverable.

In the waste flues, in a well-manipulated setting, the heat losses should be at a workable minimum, and the flues appear black. The fullest recuperative powers will thus be permissible, if these flues are kept well cleaned to permit the quickest radio-conductivity of heat from the waste gases through the tiles to the ascending secondary air.

There is one chemical element that exists in coke fuel—viz., the nitrogen—that is at present unrecovered. I believe that in the near future its recovery as ammonia, and ultimately as sulphate, must, with the trend of events and research work, be eventually effected.

Discussion.

The President (Mr. E. H. Swain, of Pontypridd) remarked that they had heard an excellent paper; and he hoped there would be a good discussion.

Mr. J. H. Canning (Newport) said that before proceeding to discuss one or two matters in connection with Mr. Madden's paper, he felt sure that he would be voicing the feelings of all in complimenting him upon having brought forward so practical a paper. Though short, it contained an immense amount of really useful and quite detailed information. He had seldom seen a paper—and he said this sincerely, without any flattery—of even three or four times the length, which contained so much suggestive

information as Mr. Madden gave. It was a paper which appealed to all of them, whatever might happen to be the size of their works; and another very important point about it was that it dealt with a subject which was not of occasional interest or occurrence. The furnaces in gas-works were in operation day and night, year in and year out; and any economy that could be effected in regard to them was always a substantial one. He knew that Mr. Madden had for some considerable time past adopted the method which he had explained in his paper, and with very good results; and he thought they were to be congratulated upon the fact that they had induced him to come forward with his paper. There was one thing which could not be too strongly insisted upon; and it was that, as Mr. Madden had said, it was absolutely essential that the depth of the fuel-bed should be maintained in all regenerative furnaces. In fact, there was one point upon which he would like to criticize their present terminology in this respect. They called it a "furnace" or "producer furnace;" but really, strictly speaking, there was nothing of a furnace about it. It was a producer or gas generator pure and simple, and should be treated as such. Many of the errors into which they all fell were due to the fact that they looked on these things as furnaces, not as generators. Of course, anybody who was acquainted with the working of a water-gas plant never looked upon the generator in that case as being a furnace, but regarded it as a generator pure and simple. They would all work better if they thought of generators, and not of furnaces. The point that most struck him with reference to the paper was the extreme simplicity of the method which Mr. Madden had adopted to achieve the end he had in view. He (Mr. Canning) could imagine nothing better or more effective than the blanket of breeze he used to prevent the tremendous uprush of air which was evident to anybody who looked into the waste flue of a regenerator furnace shortly after the fire had been cleaned. In addition to the simplicity of the method, it accomplished a beautiful automatic regulation, because, as the author said, this blanket of breeze burnt off in a very gradual manner for a considerable period after the clinkering had been finished, and as it burnt off, so, in proportion by the formation of clinker, the passages for air through the fuel were gradually diminished, and equilibrium was established, not in a sudden manner, but with absolute regularity. Now there was one aspect in which the paper was of more interest to this particular Association than to any other with which he was acquainted. Owing to the nature of the ash, he did not say of all South Wales coals, but of the sorts generally used by gas-works in the locality which employed local coals, clinkering had, as a rule, to be performed two or three times as often as in many districts of which he knew, where the fuel was more favourable. Consequently, the loss and the tendency to local heating, both of furnaces and of settings, to which Mr. Madden had referred, was a very serious matter. The premature breakdown of many settings was distinctly attributable to it. This loss was going on, as he had just said, two or three times as often in their district as in other more favourably situated ones; and therefore they should all endeavour as far as possible to prevent such a waste of fuel. There were two questions he would like to ask the author. The first was whether he had ever traced any cooling effect due to the use of the breeze which was put on to the fire cold. He did not anticipate that there could be much. The second query was as to whether it had any effect in perhaps slightly reducing the heat of the retorts during the hour or so until it burnt off. He thoroughly endorsed Mr. Madden's view with regard to the recovery of nitrogen. At the present time, there was considerable agitation—almost amounting to a scare—as to the supply of nitrogen, which was absolutely necessary to maintain the food resources of the globe; and everybody was looking to atmospheric air. But considering that now they themselves and coke-oven people, and others who used recovery plants of different kinds, were only recovering, he believed, roughly one-seventh of the nitrogen content of the coal they used, there was very great scope for improvement—and an improvement which would be of the utmost benefit to all.

Mr. Evan Rees (Blaina) remarked that Mr. Madden's paper on modern retort-house practice had been very enjoyable. The point that specially appealed to him personally was the breeze control; and he would tell the members what his own results had been when using this method on the small works of which he had charge. Mr. Madden and Mr. Canning had alluded to the extreme simplicity of the idea; and he might say that he (the speaker) had not up to the present time noticed any loss in heat so far as the retorts themselves were concerned. Those who were prepared to try this "wrinkle" of the application of a blanket of breeze to the incandescent fuel would be agreeably surprised when, at the end of a certain period, they studied the results. If observations were taken for (say) 28 days of the actual amount of fuel used in the setting, and a record was kept of the heat of the setting, they would feel astonished that this suggestion of Mr. Madden's had not been brought forward a long time ago. The method of application was quite simple, and entailed no trouble whatsoever. The breeze filtered very slowly through the mass of coke; and, speaking generally, it was a decided advantage in the operation of regenerative furnaces.

Mr. L. J. Langford (Abertillery) thought the suggestions made by the author were suitable for adoption by every one of the members, both in large and small undertakings. It was a splendid idea to insert a tube at the top of the oven arch, to see how the furnaces were controlled. Some of them had miserable subways to go down; and with these tubes they would be able to keep the furnaces under observation without spending so much time downstairs, after once getting the furnaces under control. The idea of the breeze blanket was a very happy one—especially when it was pointed out that the producer took perhaps 1½ hours before resuming normal conditions. He felt sure that many of the members would act on this suggestion, and that they would find the fuel consumption greatly reduced thereby.

Mr. W. C. Jackson (Merthyr) said that the question of furnace control had always been of great interest to him; and he was confident they would all benefit from what they had heard that morning. With regard to the breeze Mr. Madden had spoken about, there was one difficulty he could perceive, and this was in getting it spread properly. How did he manage it? No doubt in the author's case the feeding plug was set at a fair workable angle; but in some settings with which he (the speaker) had had a good deal of experience, the feeding plug was set at a much deeper angle, and it was very difficult to get the coke back properly, let alone breeze. This was a matter which some of the manufacturers might study a little more in the designing of settings. He found it a great difficulty in some instances to get the men to push back the coke, no matter what tools they were given to work with; and this was because the feeding plug was set at such an awkward angle. He was also very much struck with the idea of the piece of piping at the top of the setting. For himself, he merely carried a pair of pliers in his pocket, and when necessary drew out the combustion chamber plug. As to the secondary air, he had heard of a dodge for dealing with this. In fact, his last chief used to work it, he believed. This was to fix a mica flap arrangement on the secondary air ports. When there was a little more pull, the flap closed somewhat, and less secondary air went through. He would like Mr. Madden to tell them whether he experienced any difficulty in spreading the breeze over the top of the coke.

Mr. T. E. Franklin (Barry) said the author had reminded them once more, as Mr. Newbigging had done for so many years in his text-book, of the fact that dividends were either made or lost in the retort-house. With regard to the depth of fuel in the producer, they all knew that unless this was considerable it acted as a furnace, as Mr. Canning had pointed out, instead of as a producer. A good thing was to get each stoker to chalk down upon a board in the retort-house the number of retorts of coke that he had put into the furnace each shift. By explaining the matter to the stokers, and giving them an interest, one could get them to keep the fuel deep by filling up even, if necessary, with coke from other retorts than those the contents of which were generally put into the furnace. They would often be astonished to find—especially if the retort-beds were not all worked from the same stack—what a variation there was. He remembered particularly one instance in which he had a long chimney working a number of beds, and quite a short, dwarf stack working others; and he found the fuel consumed (no matter how he regulated it) by the furnaces worked by the high chimney was much greater, and the heats were not so regular. Therefore, where possible, he thought it was very advisable that long chimneys should be done away with, and shorter ones adopted. It might cost a considerable amount of money; but he was sure it would prove a saving in the end. He found that, with short stacks, they could tell very well what condition their furnaces were in, as far as pressure was concerned, when the lid of the feeding-door was removed, by getting the draught so regulated that there was a sort of oscillation taking place of the gases in and out of the furnace-door. When this condition of affairs existed, it seemed to him that they had the maximum efficiency in the furnace, and very little more could be obtained. It was disagreeable to have to go touring round the cellar, and taking observations of the secondary air-chambers there; and it was a plan that did not give much assistance, unless it was followed up regularly. It was necessary to select the particular times for taking the observations that would enable them to hit upon the furnace when it was in the same condition each day. Otherwise, they would never know where they were. It was a matter of interest to know that there was hope of recovering so much of the nitrogen. They had heard and read for many years of the process of coal liming; but the only place he knew of where it was in operation at the present time was Cheltenham. If the nitrogen could be recovered in a practical form by treatment of the furnace gases, it would be a very good thing indeed—especially for those people who had separate outside generators, as was the case at Glasgow and other places. With reference to the breeze blanket, he agreed with the previous speaker that, unless one went round the retort-house pretty frequently, it was one thing to say that some work should be done, and quite another to have it done. It would be a splendid idea, if carried out properly; and he, for one, would certainly have a good try at it.

Mr. F. C. Mortlock (Whitland), while agreeing that the breeze blanket was a very good suggestion, asked the author whether he did not find that it had a tendency to increase the clinker.

Mr. Madden, in replying on the discussion, referred first to Mr. Mortlock's question, and said he had not noticed any increase in the clinker—the amount of breeze put on was not sufficient for this. Mr. Canning had made some remarks about their practice in regard to furnaces generally; and this was a point deserving careful consideration. The modern regenerative furnace was such a beautiful instrument, and so finely made, that they were rather apt to think it would look after itself; but, just because it was a beautifully balanced instrument, it did need attention. He agreed

with what had been said as to the depth of the fuel-bed; but, of course, this was governed to some extent by the grate area. Mr. Franklin raised a point as to chimney stacks, where fuel burnt away very rapidly; and it occurred to him (the speaker) that it might not be altogether a question of the length of the stack, but possibly of the grate area of the furnaces, and of the primary air having to travel through so rapidly to secure the heat required. A good wide grate area and slow travel were better than a narrow grate and quick travel.

Mr. Franklin said he thanked the author for the suggestion, but it was not correct. He always found that with a long stack he could not get control over the furnaces, because the draught, owing to the direction of the wind, and from other causes, was so variable.

Mr. Madden (continuing) said Mr. Canning was quite right in his contention that it was really a gas-producer, and not a furnace. The same gentleman had asked whether he traced any cooling effect to the use of the breeze. Very little breeze was put on—only just sufficient to act as a light blanket; and as the fire was clinkered immediately after, the rush of air through the breeze made it incandescent in a very few minutes. He had not noticed any result such as the question suggested, because, as he had said, it was counteracted by the upward rush of gases during the operation of clinkering. It was just a momentary effect. He was associated with Mr. Rees a year or two ago, when his works were reconstructed; and after the regenerators were got to work, Mr. Rees was good enough to try his (Mr. Madden's) suggestion, and so was able to corroborate the results he had himself obtained by using breeze in his own furnaces. Mr. Langford thought the top pipe was a good thing, as saving a lot of cellar work. This was one way of looking at it. It certainly saved a great deal of time. One could see the pressure, and ascertain the conditions existing. As to Mr. Jackson's remarks, he might say that, of course, when the idea of breeze control appealed to him, he simply arranged things to meet his own conditions. He could quite understand that there were a good many settings in which it could not be so easily done. It was a question of the design of the setting. It was necessary to take into account the angle; but as not a great deal of breeze was used, it might be found that the difficulty could be overcome. If they could make the idea suit their conditions, he thought that, having once tried the method, they would continue it. Reference had been made to outside producers in connection with the ultimate recovery of nitrogen. He thought if the nitrogen was to be recovered, it would be by means of external producers. This seemed the only practical way of securing the chemical result.

GAS TESTING FOR SMALL WORKS.

By Evan Rees, of Blaina.

[A Paper presented to the Wales and Monmouthshire District Institution of Gas Engineers and Managers, May 9.]

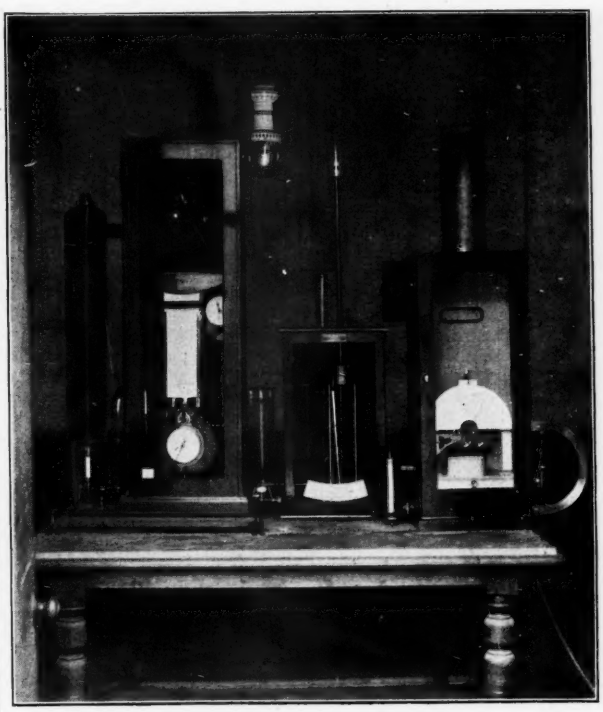
In meetings of this kind, where members assemble for mutual exchanging of notes and discussion on the various processes and problems that arise in the daily routine of the gas manager's life, the difficulty that arises in venturing to present a short paper is to find a subject, out of the ever-increasing channels that offer themselves—both to the theorist and practical man alike—that will be of sufficient interest to hold the attention of our fellows in charge of works of first and second magnitude, fitted replete with all the modern improvements that science is capable of producing and constructional skill of accomplishing, and also sufficiently interesting (and possibly more important) to the engineer and manager in charge of the small and medium-sized undertakings which, in all District Associations such as this, predominate in number. To the former, the question of gas testing is one of usual daily routine; the work being performed in well-fitted laboratories by the technical assistants generally employed on these works. But to the latter, the laboratory, with its numerous delicate pieces of apparatus and accessories, is barred—probably on account of the cost of fitting up, but mainly because of the absence of the necessary time that must be given daily to carrying out the experiments. The demand upon his time, both in the works and district, leaves little opportunity for the performance of testing, which is of such paramount importance at the present time; and it is with these thoughts in mind that I present this short paper on the necessity of "Gas Testing for Small Works."

The first item that presents itself is the choice of suitable apparatus, which shall be capable of a simple and easy method of determination, or of recording on sight the observations desired as to temperature, atmospheric pressure, specific gravity, illuminating power, and calorific value. The foregoing I am of opinion would be sufficient to obtain the desired information regarding the actual value of the gas sent out to the ever-increasing and often critical gas-consuming public. The selection of suitable instruments can be made through perusal of the catalogues of several makers of world-wide repute in the gas industry; and reference to descriptive articles which have appeared from time to time in the Technical Press, as well as to the several standard works, will be of material assistance in the matter.

The day of rule-of-thumb working is now relegated to the past. In its place has arisen the day of scientific working and actual chemical determinations; and at the outset the question of testing is one that naturally arises, and will continue in every department of gas manufacture. Present-day carbonizing practice demands testing of furnace gases; their proportions having definite effect upon the heating result of a setting or settings, the life of refractory material, and the yield per ton, leaving out of consideration the analysis of the primary and secondary materials—coal and coke. In like manner is analysis necessary in the purification process. The market values of tar, ammoniacal liquor, and spent oxide depend largely upon their chemical composition. But it is the finished product that I more particularly desire to deal with.

Firstly, then, an instrument for ascertaining by a quick and simple method, or that will indicate, the specific gravity, will be a valuable adjunct to enable gas engineers to develop and provide a gas of regular and unchanging gravity. The importance of regular density is obvious, as a regular density or gravity, coupled with a constant calorific value, would mean that much-desired perfection of air regulation in incandescent gas-burners and the present-day gas-fires; but a constant calorific value has its many undoubted advantages to a large extent nullified if accompanied by irregular density or gravity.

It is almost unnecessary for me to say that, in these days of keen competition between lighting authorities for the supply of private and public lighting, and while incandescent lighting by means of high or low pressure gas still holds the field, it is imperative that incandescent burners should be used at the point of greatest duty and advantage; and a perfect air mixture is the *sine quâ non*, or something indispensable. Present-day gas-burner



Apparatus Employed in the Testing Room.

makers provide many admirable devices for the regulation of the air supply to burners used for lighting or heating; and though a change in the calorific value would not materially affect the illuminating efficiency, supply the same burners with a gas of different gravity, and the result to the lighting efficiency is more to be thought of than realized.

The following is a brief description of the apparatus employed for the foregoing purpose.

The instrument used was Schilling's diffusion apparatus, which was adopted on account of the simplicity of the method of determining the specific gravity of the gas, and is based on the fact that gases issuing under similar conditions of pressure from a minute orifice in a metal plate flow through it at rates which vary inversely as the square roots of their densities.

The apparatus consists of a cylindrical glass vessel, within which is placed a glass tube. This is fitted at the top with a metal cap, while its lower end is inserted into a metal base, serving as a foot and also as a weight to keep the tube immersed in water. The upper cap carries two cocks—one at the side, and the other on a short upright pipe. The cock on the short upright pipe is really a three-way one, and is provided with a pointer and index, which is marked "on," "off," and "vent." The glass tube has two marks engraved on it—one near to the base, and the other near to the metal cap at the top.

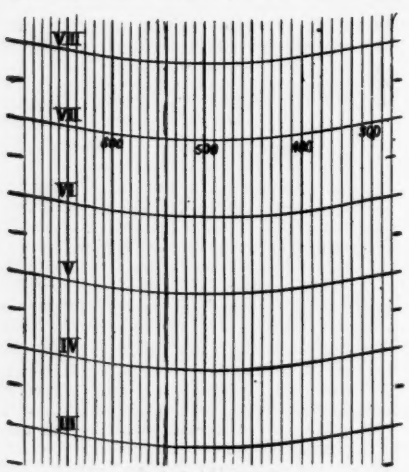
The specific gravity is determined by ascertaining the time in seconds which it takes equal volumes of air and gas under equal pressures to escape from a minute opening in a thin disc of

platinum, which is fixed in the nozzle of the three-way cock. When the latter is in the position of "on," the only aperture for the passage of air is through this minute opening; and the specific gravity of the gas is obtained by dividing the square of the time in seconds taken for the gas to escape by the square of the time in seconds taken for the air to escape. In making a test, the tube is immersed in the vessel containing water, and is charged with air by raising it and letting air enter through a bye-pass in the stopcock. The cock is then closed, and the tube re-immersed. The plug of the cock is next so turned as to allow the air to escape through the hole in the disc; and as soon as the water reaches the lower mark on the tube, a minute clock or stop-watch is started, and stopped immediately the water reaches the upper mark—the time in seconds being noted. The tube is then charged in a similar manner with gas; the supply being connected to the side-cock by means of a flexible metallic tube. When filled with gas, the time occupied in emptying is noted as before, and the simple calculation worked out.

As an alternative, a specific gravity indicator can be used, which indicates continuously on a dial. The principle of the indicator is simply the passing of a small volume of gas continuously over the crown of a suspended bell, and consuming it in a burner fixed on a vertical tube. The weight of the volume of gas passing across the crown of the bell raises or depresses it in exact ratio to its weight in comparison with the atmosphere. The extent of this rise or fall is transmitted to a pointer, which, in turn, indicates on a scale which is figured from 1 (zero) to 0. The bell moves in exact sympathy with the slightest change in gravity; and thus it forms a continuous and automatic indicator. This instrument once set up and adjusted, requires no further attention; and the indications do not need correction for temperature and atmospheric pressure. My experience of the use of both types of apparatus has been thoroughly and entirely satisfactory.

We are all familar with the several types of photometers on which the statutory tests for illuminating power are carried out in accordance with the provisions of the Gas-Works Clauses Acts; and in the majority of cases the "Metropolitan" No. 2 burner is the one used. Although much discussion and Press matter have been published as to the merits or demerits of the change from the No. 1 "London" argand, gas companies and corporations have succeeded in getting permission to insert the necessary clauses in their Bills before Parliament for the use of the new burner—and rightly so, as the full illuminating power of the gas is perfectly developed. This modification is undoubtedly the precursor of a change from the illuminating standard now in vogue to the general adoption in the near future of the calorific value standard. Until the change is effected, however, the illuminating standard has to be complied with; and it is sufficiently well understood as a maxim that the illuminating power of a gas cannot be expressed absolutely, but only as the illuminating power developed by the use of certain burners, or a combination of burner and chimney, and that it is dependent on the rate of consumption of gas in the burner, and to some extent on the kind of photometer used. The inferential or jet photometer is the instrument lending itself to rapid observations of the illuminating power of coal gas. This instrument, delicately governed, and capable of adjustment to a nicety, when properly rated to the No. 2 burner standard, will give approximately correct readings, and for all practical purposes will fulfil the requirements stipulated.

It is, however, an important question for all concerned in the industry at the present time, either as suppliers or consumers, to what extent (if any) does the present practice of prescribing and testing for illuminating power only, which prevails in the majority of small works in the United Kingdom, serve to guarantee the efficiency of gas for its more modern uses—such as incandescent public and private lighting, cooking, domestic heating, industrial operations, and the production of motive power. Present-day methods of domestic lighting and heating, apart from the use of gas for industrial operations and motive power, lend themselves rather more to the calorific than to the illuminating test; and the determining factor in all these cases is the heating value or thermal efficiency. These conditions, then, impose upon suppliers of gas the necessity for the use of a calorimeter.



Date: April 30, 1912.

Temp., 58° Fahr. Bar., 29·8 in. Illuminating Power of Jet, 14·5 candles. Gas Pressure, 0·67 in. Calorific Value, 540 B.Th.U. Specific Gravity, ·4.

Calorimeters are fairly numerous and varied in type, and represent a high degree of technical skill and inventive genius; and one of the several reliable forms of the recording type will be the kind to suggest as desirable by which to ascertain the heating value of the gas supplied. The calorific power of gas is a property the importance of which has only within recent years loomed into the horizon of gas manufacturers; and while in past decades methods of manufacture have been without direct regard to its value as a fuel in the development of heat energy, the present-day demands more its value as a heat producing rather than an illuminating agency. The calorific power of coal gas is influenced by the manner in which it is manufactured, and its consequent composition.

Of the several instruments available, choice fell on one of the recording type, which would fulfil the condition set down at the outset, "to record on sight"—one which would measure within a reasonable degree of accuracy, and record the calorific power of the gas supplied, as well as give the continuous record obviously desired in controlling either the manufacture of gas or the use of it for its several purposes. The instrument selected for this portion of the work was the "Sarco" (Beasley's) recording calorimeter [described and illustrated in the "JOURNAL," Vol. CVII., p. 758]; and the principle of the calorimeter may now be briefly summarized.

The gas is burned within a well-radiated chimney; and the working of the calorimeter depends upon the fact that the average rise in temperature of this chimney is proportional to the heat developed by the gas-flame. The chimney contains an annular chamber, which forms one limb of a U-tube; the other being a simple tube maintained at atmospheric pressure. The U-tube is filled with oil; and, as both limbs terminate in tanks, it is possible, by means of floats and suitable pulleys, to indicate and record the difference in level between the two limbs of the U-tube, caused by the expansion of the oil in the hot limb. The chimney and the "cold" limb are connected through to tanks contained in a case, together with the clock, paper gear, and other apparatus; the whole being fitted on a cast-iron base and back.

In a calorimeter of this kind, it is obvious that the flow of gas must be automatically maintained at a constant and predetermined rate, if accuracy is to be attained. To effect this, it is first necessary to control the pressure by means of governing apparatus, so that, in spite of variations at the inlet of the governor, the pressure at the outlet remains constant. This in itself is not, however, sufficient; for if no other method of regulation were provided, the quantity of gas passing would be controlled by the size of the orifice whence it issues, and the pressure, and also the rate of flow, would consequently vary with the specific gravity of the gas—rendering the record of the calorimeter uncertain and misleading. To overcome this difficulty, a special regulating test-meter is provided, with the measuring drum geared to a pendulum escapement. The drum of the meter drives this escapement just as the spring of a clock drives the clock; and in the same manner as a clock escapement controls the speed of the clock, so the escapement attached to this meter controls the speed of the drum—thus ensuring a constant rate of flow unaffected by variations in specific gravity, or, in fact, any slight frictional variations in the apparatus.

The instrument is calibrated to show the calorific value in British thermal units per cubic foot of gas measured under standard conditions of 60° Fahr. and 30 inches barometer, and is arranged to burn 2 cubic feet of gas per hour. The instrument gives results assuming that 2 cubic feet of gas are supplied under standard conditions; and a thermometer is provided on the gas supply, so that the usual corrections may be made for any variation. The gases escape through the chimney; and it is the net, and not the gross, calorific power that is recorded.

All the foregoing instruments fulfil the conditions laid down, in their ability to record the value and efficiency of the product to be used by the public. By the use of these several pieces of gas-testing apparatus, I have been able for some time past to make a considerable number of daily observations; and the results of these observations, which may possibly be of some interest to you, are as follows:—

1.—That the varying composition of the gas was clearly and definitely ascertained by the change and specific gravity, caused by a varying proportion of nitrogen, the presence of carbonic acid, or a lessening of hydrocarbons.

2.—The variations in the illuminating power of the gas by the jet photometer were maintained within the limit of ½ to 1 candle over the parliamentary standard; and the recording calorimeter showed that for a 14 to 15 candle power gas the variations of calorific value on the average ranged between 490 and 560 B.Th.U.

3.—That it was reasonably possible to maintain an almost straight line in the region of 520 to 540 B.Th.U. in thermal efficiency from day to day.

From these observed results, it will be seen that the thermal efficiency of coal gas has a proportionate and comparatively well-defined bearing on its illuminating power when utilized for mantle incandescence, and a more direct relation when used for heating or power purposes, though it must be borne in mind that no close

relationship can be safely assumed to exist between the illuminating power and the calorific value.

The observations showed that, while there were variations in the composition of the gas from time to time, the effect on the efficiency of its value when used for lighting, heating, or power were such as gave no cause for complaint; but the result of having the readings of quality at command was that definite measures could at once be taken to bring its quality to standard. These results are not for any particular day or days when working conditions were favourable, or the outcome of any extraordinary precaution or supervision, but are the results from the daily ordinary routine of a small gas undertaking under prevailing conditions and circumstances.

While gas testing is of supreme importance as far as the technical side is concerned, I think I should be justified in stating that there is a commercial aspect of the question that deserves consideration. Daily tests of the finished product will lead to closer observation of the behaviour and value of different types of retort-settings when heated by varying proportions of gaseous fuel, the results obtained from the carbonization of various coals in gas composition, and the value of the resultant residuals.

The residuals chiefly concerned in small works are confined to coke, tar, and ammoniacal liquor; and upon the chemical composition of these depends the price that may be obtained for them. Tar, which has such a multiplicity of uses, has always been an important source of revenue; and with the adoption of it in almost every town in the country for the manufacture of tarred macadam, and road tar-painting for the prevention of dust, it has become a still more valuable commodity. The Road Board, who are in a large measure responsible for developments in this direction, have specified the composition of the tar most suitable for the purpose; and in order to meet their particular wants, testing is necessary to gauge the true market value of the tar. The same can be said of ammoniacal liquor. Its ammonia content, revealed by chemical test, is the factor that counts in its value for the manufacture of sulphate of ammonia.

There is also another aspect of the commercial side of gas testing or examination—namely, the consumer. While rapid and tremendous strides have been made in the last decade in the production of apparatus suitable for the consumption of gas under varying conditions and circumstances, the question of heating efficiency in the gas supplied, as well as in all the consumers' appliances for its use, comes foremost. In order to maintain the high state of efficiency that is at present generally associated with coal gas, many theories have been voiced, and numerous innovations put into operation. Constant pressure and thermal efficiency have been some of the many factors in the attainment of this result. Again, with a constant thermal value comes the necessity of testing; and in order to maintain the present high standard, and possibly still improve the efficiency of gas as an illuminating agent for public and private lighting, as well as its undoubted reliability for domestic cooking, heating, power, and industrial purposes, testing in works, either large or small, must necessarily become part and parcel of the daily routine. The circumstances of our modern civilized life have conduced to the use of gas as a necessity in domestic circles; and its adaptability for industrial and power purposes makes its sphere of usefulness an ever-widening one.

Therefore, the conclusion that one must naturally arrive at is this: Whether gas is consumed by the public in the small mining or country town or the city or influential residential quarter, the efficiency of the product must be the attainment of the nearest to perfection in consistent quality and value under practical working conditions, so that the present high standard may be surely continued. The utilization of the before-mentioned instruments would be conducive to the mutual advantage of supplier and consumer. The modern methods of manufacture, distribution, and use, in my opinion, call for the provision of suitable instruments for the testing of gas in small works.

Gas-Engines and Producer Plants in Textile Mills.

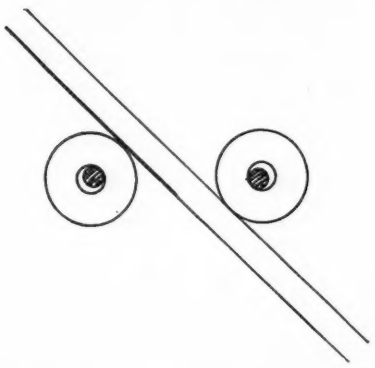
At the May meeting of the Manchester Section of the Association of Managers of Textile Works, held under the presidency of Mr. W. T. Boothman, a paper was read by Mr. William Stead on "Gas-Engines and Producer Plants of To-Day, and their Suitability for Driving Textile Mills." Some four years ago, Mr. Stead delivered an address before the members of the Society, in which he demonstrated the great superiority of the gas-engine over the steam-engine in "over-all" efficiency; and he now said he had been led to inquire how it was that mill managers had been slow to adopt the gas-engine. He had come to the conclusion that there were two main reasons—one the cheapness of fuel, the other the cheapness of steam-engines. Owing to the cheapness of fuel, millowners found the amount saved in this respect by the use of a gas-engine was not sufficient to compensate for the sum which had to be paid in interest on the greater capital outlay on the plant. Another great stumbling-block had been the widespread feeling as to the unreliability of the gas-engine. Mr. Stead, on this part of his subject, pointed out, however, that during the past few years very considerable progress had been made in the design of gas-engines and producer plants, so that now there was practically no branch of trade in which the internal combustion engine was not replacing the use of steam. Proceeding, he described some late improvements effected in gas-engines and producer plants for use in textile mills.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Automatic Locking Gear for Gasholder Cups.

SIR,—May I be allowed to thank Mr. T. O. Paterson for his letter, and the photos. you reproduced, showing the automatic locking gear on the holders at Birkenhead of so long ago as 1865. These are certainly interesting, and do at any rate prove that the idea innocently put forward by me as being entirely novel, is sound and practical. If there is any possibility of lifts jambing, as stated at Ilkeston, probably it will come to be accepted that the extra attention necessary to keep the gear in order is a small premium to pay as insurance against such a calamity.



If it is not too late to reply to your criticism of my paper read at Peterborough, may I explain by the aid of a diagram what I mean, and what you refer to as being "a little bit confusing." The diagram shows in an exaggerated manner what would happen if the spindles of rollers (which are shown in section) were not made so tight fitting as hitherto. By an ordinary eccentric adjustment, the spindles could be made to bring-up the rollers into perfect position with the rails, while at the same time leaving the rollers free to roll. Thus the holder so fitted would be quite as steady, stand-up to the wind just as well, and at the same time—because the rollers were rollers, and not slide-blocks—it would be more free to rise and fall with the gas supply inside, than otherwise.

A. F. YOUNG.

Bury St. Edmunds, May 8, 1912.

Early Days of the British Association of Gas Managers.

SIR,—In the "JOURNAL" for the 30th ult., there is a very interesting article relating to the founding of the British Association of Gas Managers, upon which I desire to say a few words.

The preliminary meeting was held, as stated, at the Royal Hotel, Manchester, and I was present thereat, and took part in the proceedings; yet my name is not recorded. The meeting was adjourned for a week, but another place had been selected for it, of which I had failed to take notice in reading the circular, and unfortunately I had left this at home. So, on presenting myself at the Royal, I learned to my chagrin that no room had been engaged there. Of course, I did my best to discover the altered place of meeting, but failed in the attempt until late in the afternoon, on my way to Longton, when, at the London Road Station, I met Mr. Fraser, of Loughborough, and my brother William (then of Burslem), who informed me that the Association had been established. Now, my brother's name is also omitted from the list of founders, although he was undoubtedly present at the passing of the resolution. Further, there is no mention in the list of Mr. T. G. Barlow, whom I remember to have presided, and who was elected our first President.

I need hardly say that I consider myself entitled to a place in the list.

HENRY WOODALL.

Llandudno, May 10, 1912.

[The list referred to is exactly the same as that given in the first volume of the "Transactions" of the Association, where it is recorded that among the many letters received from Managers regretting their inability to be present, but testifying their approbation of the objects of the meeting, was one from our correspondent, who was then at Longton.—ED. J.G.L.]

The Alkali Clause.

SIR,—Our company has had the alkali clause imposed on it. The clause says that we shall not "purchase" any material "or use" in manufacture, &c., any material. If we cannot purchase how can we use unless we "beg, borrow, steal, or exchange." It has been proposed to add the word "for." To read "purchase for" or use. It seems to me the "or" ought to be "for." Then it would be "purchase for use." But anyhow suppose we get a truck of pitch from a neighbouring gas-works where they make up residuals. Will these alkali people have a right to admittance to our works to find out whether we use the pitch for thickening our tar for road purposes, for lining a water tank, for making a floor, or a flat roof? Refused admittance, will they engage a detective, charter an aëroplane, anchor it to our chimney stack, and watch the truck of pitch until pitchy darkness "queers their pitch," and what will the penalty be if some of the pitch gets pitched into the tar-well? These so-called alkali manufacturers, whose chief business appears to be acid making, are so mighty 'cute I think they must be Yankees who have out-Englished us in shop-keeping methods.

SALT.

May 11, 1912.

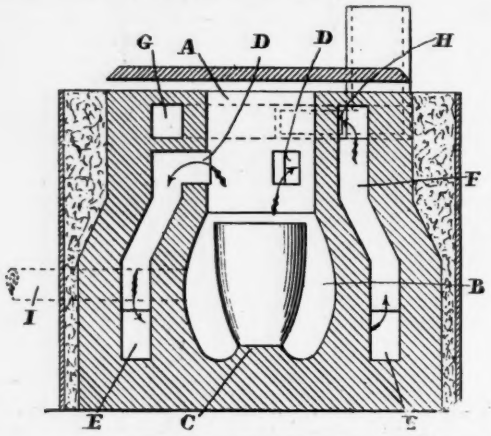
REGISTER OF PATENTS.

Crucible and Melting-Pot Furnaces Heated by Gas.

TOOTH, L. F., of the Commercial Gas Company, Stepney.

No. 30,287; Dec. 30, 1910.

The object of this invention is to construct a gas heating furnace in such a manner that the heat is applied equally all around the crucible and to the wall of the chamber containing it, so that the wall is "of the same uniform incandescence and temperature throughout, thereby ensuring not only a thorough heating, but also an equal temperature of heat to all parts of the crucible and its contents.



Tooth's Gas-Heated Crucible.

The furnace shown is made of fire-brick, with a passage or opening A from the top leading to an enlarged circular lower part or chamber B, in the bottom of which is a raised platform C on which the crucible is positioned. In the passage A are three or more openings D, leading by flueways downwards to an annular flue E, near and around the bottom of the chamber.

From the ring three or more other flues F lead—being alternately arranged with the other flueways connecting with an annular flueway G near and around the passage A, and provided with an outlet leading to the chimney. The top of the opening A is closable by a lid or door (properly luted) to prevent the escape of products of combustion at that part.

The furnace is inside a metal jacket—the space between being packed with slag wool or other heat non-conductor, to prevent radiation of heat from the furnace.

The burner I has its nozzle so positioned with regard to the chamber B that the flame is projected tangentially to the chamber. The chamber being circular, the flame travels around it and the melting pot in a centrifugal manner—commencing near the bottom of the chamber. It will thus be equally applied to all parts of the chamber and crucible, and, rising, will pass into the passage A, and through the openings D down into the annular flueway E, and from thence, by the flueways F, into the annular flueway G, and away through the outlet H to the chimney; the whole (or the whole of the centre part) of the furnace being "rendered incandescent equally throughout by the flame and products of combustion in this circuitous travel through the chamber and the flueways."

Manufacture of Fuel.

SMITH, E. W., of West Didsbury, Manchester.

No. 7274; Sept. 23, 1911.

This invention relates to the manufacture of "smokeless fuel" by the partial destructive distillation of bituminous coal; its object being "to provide in an efficient manner for the rapid generation of the gas produced during such distillation, and for the production of a large volume of gas per ton of coal, and of a firm or hard smokeless fuel."

The proposal is to heat the retorts containing the coal (in small pieces) by means of furnace gases, and maintain a temperature within the heating chamber or furnace of about 1200° Fahr., which gives a temperature of about 1000° Fahr. in the retorts. During the distillation process, there may be introduced, in the form of spray or otherwise, the light volatile hydrocarbon benzol, or, preferably, the light hydrocarbons which are obtained by the distillation of the tar produced during the process already described. By means of the latter hydrocarbons, "the gas evolved would be enriched and increased in volume, and the value of the residue as a smokeless fuel enhanced." The retorts employed [described and illustrated in the "JOURNAL" for Feb. 27, p. 596] are made of "suitable form to provide for the uniform heating of the material within them; and the gas evolved is treated in the manner usual in the process of gas manufacture."

By employing furnace gases at the temperature named, and continuing the heating until the whole of the illuminating gas is evolved, the inventor says he is enabled to obtain the "known advantages"—namely, to considerably reduce the period of heating, to obtain a large volume of gas per ton of coal treated, and a hard, smokeless fuel, while the latter retains practically the whole of the heavy hydrocarbons which ensure easy ignition of the fuel and a smokeless flame. With retorts such as shown in his patent No. 7273, referred to above, having the smaller cross sectional dimension of about 5 inches, the heat treatment will be completed in about 3¾ hours.

Purification of Coal Gases.

HIBY, W., of Sandal Cliff, near Wakefield.

No. 9632; April 20, 1911.

The patentee in his specification says: The deposition of naphthalene from gases produced by the carbonization of coal (whether in coke-ovens, gas-works, or the like) has always given trouble in the plant used for recovering bye-products or for purifying the gases or in the mains and pipes for the distribution of the gases. In order to avoid the obstructions formed by the deposition of solid naphthalene, the aim in practical working has generally been to cool the gases as slowly as possible, so that tar oils are carried forward with the gas and subsequently condense or settle with the naphthalene—thus dissolving the latter and preventing the apparatus from becoming blocked. In his experience, however, this result, if achieved at all by the slow cooling, is not effective in overcoming the difficulty in question, and very often special apparatus for washing the naphthalene out of the gases by suitable solvents are required in addition to the slow cooling above mentioned.

He has found that the slow cooling of the gases has the disadvantage of causing or enabling them to retain part of the naphthalene. According to the present invention, he cools the gases as suddenly as practicable at a part of the purifying or recovery system where the temperature of the gases is near the dew-point of naphthalene—a point which varies with many factors; but in the case of coke-oven gases produced from washed and moist coal, it is generally about 40° C. The sudden cooling or chilling of the gases proposed to be adopted has to be accompanied by the mechanical or dynamic action upon the gases of a forcibly injected spray of the cooling agent, "as it is only by such action that the naphthalene crystals can be removed from the gases in an automatic and continuous manner."

The most practicable mode of such sudden cooling of the gases is by a spray of water or gas liquor injected into the gases in such manner that the spray fills for a considerable distance the whole cross section of the space through which the gases travel, and that the injected cold water or liquor and the gases travel with different speeds, so that the naphthalene crystals formed through the chilling of the gases are either beaten-out or stripped from the gases by the force of the mechanical action; the water or the liquor at the same time thoroughly washing the internal surfaces of the chamber or pipe into which the spray is injected, and carrying the naphthalene crystals to a point outside the flow of the gases. The necessary cooling may be effected by circulating the liquor, outside the chamber or pipe, through a cooler that will reduce the temperature of the liquor as much as may be economical.

It will be seen that it is of the essence of this invention that "the cooling agent must be forcibly injected into the gases as a spray at a part of the apparatus where the temperature of the gases is about the dew-point of naphthalene." Washing the gases by spray at this particular temperature has not been described before. It is true, the patentee mentions, that in patent No. 4001 of 1906 there is described the circulation of liquor sprayed under pressure into a gas-pipe; but the circulating liquor was not cooled, and did not effect the removal of naphthalene. It is also well-known practice to pass the gases through towers partly packed with coke or the like and having a rain or spray of water falling by gravity in the upper part of the tower, and which water is sometimes cooled before being pumped again to the top of the tower. The conditions in such towers, however, are wholly inadequate to provide the mechanical or dynamic action already mentioned.

The cooled spray condenses the naphthalene in comparatively small crystals, which are readily washed away with the liquor and can be separated from the latter in any suitable manner before it is again circulated.

Where the ammonia is recovered from the warm moist gases by freeing them from tar, and afterwards passing them through a sulphuric acid saturator while their temperature is still above or near the dew-point of the water vapour they contain, the naphthalene, or a large proportion of it, passes through the saturator; and by this invention the gases are treated by the cooled spray after they have passed the saturator. The cooling of the circulating liquor may in this case be effected by an air-cooling tower—that is, by evaporation of the circulating liquor; thus serving for the double purpose of freeing the gases from their naphthalene, and of evaporating the "disagreeable and poisonous liquor," usually called "waste liquor." The inventor says he finds that the naphthalene crystals or salts separated from the liquor circulating through the sprays are of a marketable quality without further treatment being required.

Manufacturing Metallic Incandescence Mantles.

BAGRACHOW, G., of Paris.

No. 20,018; Sept. 8, 1911.

This invention relates to the weaving or knitting together of very fine metallic filaments for the manufacture of incandescence mantles.

The patentee points out that for the manufacture of incandescence mantles made from metallic threads covered with salts of rare earths, it has been proposed to make the mantle with filaments already coated with rare earths; and it has also been proposed to make the mantle with uncoated metallic filaments and to coat it with the rare earths subsequently. Both these methods, however, possess drawbacks. In the use of metallic threads already covered with rare earths, it is impossible to manufacture the mantle by machinery; and in making it by hand, great difficulty is experienced in combining several metallic filaments covered with rare earths and in making mantles "even somewhat rude in shape." When the other method is employed—that is, when the mantles are first manufactured with uncoated metallic filaments—there may be obtained mantles of regular shape either by hand or by the use of a knitting machine; and these metallic filaments can then be coated to produce a finished mantle. Nevertheless, in proceeding according to this latter method, the filaments employed for the manufacture of the mantles must be sufficiently strong to resist the strains which result from the knitting operation; and on this account "it

becomes impossible to manufacture mantles of very thin metallic filament, as is necessary to be done in order to obtain, after the subsequent impregnation of these filaments in the bath of rare earths, incandescence mantles giving a good luminous result."

The present invention relates to a commercial process for manufacturing metallic mantles "knitted with extremely thin metallic filaments;" the mantles being then converted into incandescence mantles by means of a suitable impregnation process—such, for instance, as that described in patent No. 18,084 of 1910.

Raising and Lowering Gas-Lamps.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 9688; April 21, 1911. No. 17,858; Aug. 5, 1911.

These combined inventions relate to gas-supply connections for gas-lamps equipped with gear for raising and lowering the lamp, with or without traversing gear.

Heretofore (as the patentees mention) a lamp of the type adapted to be traversed and raised and lowered was usually suspended from a carriage provided with pulleys adapted to run on a wire rope or the like; and the gas supply was led to the lamp by a flexible or jointed tube.

The primary object of the present inventions is to dispense with the tube, by the making and breaking of a gas-tight joint between the lamp and the source of supply, and at the same time affording a safety-catch for supporting the lamp, when in position, independently of the running wire rope.

The arrangement proposed for the purpose was fully described and illustrated in the "JOURNAL" for April 23, p. 220.

Vertical Retorts.

GLOVER, S., of St. Helens, and WEST, J., of Manchester.

No. 15,140; June 28, 1911.

This invention relates to improvements in "gas off-take" apparatus for vertical retorts, and is particularly applicable to retort-settings in which the retorts are placed so close together as to necessitate special arrangements to provide for the necessary condensing area for the gas given off from the retorts. It has for its object the provision of a common off-take main provided with valves for shutting off any of the retorts, together with the condensing main, for the purpose of providing increased condensing area.

Fig. 1 is a sectional elevation of a vertical retort-setting. Fig. 2 is a cross section showing the gas off-take pipes from two retorts in the setting. Fig. 3 is a longitudinal section of the gas off-take main common to the off-take pipes from the retorts. Fig. 4 is an elevation of the gas condensing main. Fig. 5 is a cross section of the gas condensing main of construction to provide for the increased condensing area.

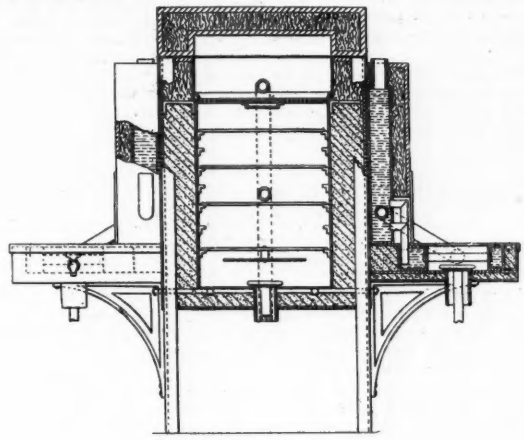
The illustrations show the application of the invention to a setting of eight retorts—arranged in two lines of four retorts each, from which there will be one gas off-take main common to the eight retorts. The retorts have their gas exits at the top; and each separate exit is provided with a slide-valve C fitted to, and within, the off-take main D, which leads the gas to the condensing main E. This condensing main is formed with an inner tube E^1, through which atmospheric air is free to circulate—"thus providing a large condensing area." The gas, on entering the condensing main E, is caused to travel in the direction of the arrows, and makes its exit through the outlet valve F leading to the foul main G. The condensation products in the main D flow into the main E, where they are collected and ultimately overflow through the valve and pass off with the gas to the foul main G.

Gas Cooking-Stove.

ROCK, W. S., of St. George's Esplanade, Guernsey.

No. 10,291; April 28, 1911.

This stove heated by gas consists of such an arrangement of the boiling-burners with relation to the oven that the waste heat of the boiling-burners is utilized for heating a water-boiler, and the waste heat from the oven is utilized for the heating of a hot-chamber.



Rock's Gas Cooking-Stove.

From the section given of this stove, it will be seen that the boiling-burners, instead of being placed above the oven (as usual), are arranged beside the oven, in a chamber beneath the hot-plate. This chamber is surrounded by a water-jacket, and has (if desired) water-tubes extending across it—the heat from the chamber being then passed through a flue-pipe arranged in a water-tank. The water-jacket around the chamber serves as a hot-water boiler, and is connected by circulating pipes with the water-tank so that a supply of hot water can always be obtained when the boiling-burners are alight.

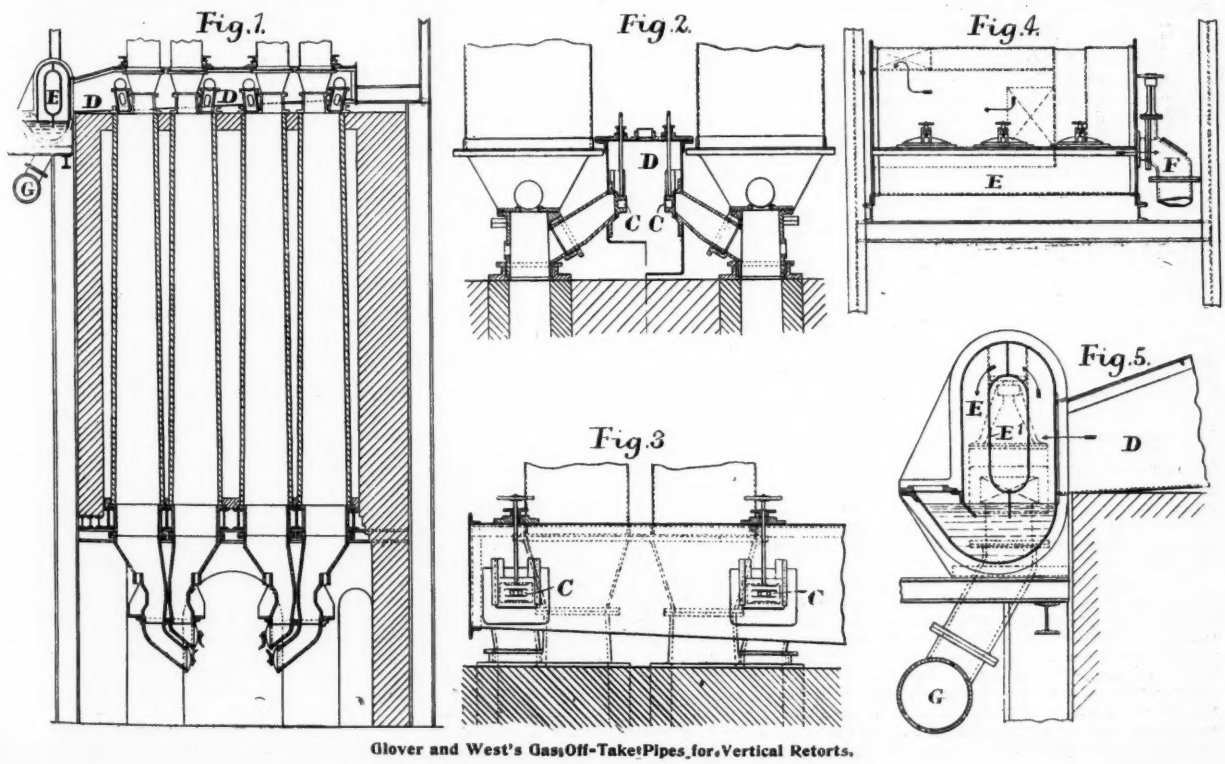
Above the oven is a hot chamber—"advantageously provided with a lid for affording ready access to its interior"—in direct contact with the top of the oven. The heating of the chamber is also assisted by a flue which conducts the heated air from the oven into the chamber above it; the flue being provided with a downward extension open at the bottom, "so as to avoid a suction of air, and thereby an unnecessary reduction of heat in the oven." Another flue is provided to allow the hot air to escape from the hot-chamber, so that proper circulation through the oven and hot-chambers may be obtained.

Signalling Device for Gas-Pipes.

MEYER, F., of Aix-la-Chapelle.

No. 24,567; Nov. 11, 1911. Date claimed under International Convention Sept. 9, 1911.

The object of this invention is to provide a signalling device to be inserted in, or connected to, a gas-pipe so as to produce a sound as soon as the velocity or the amount of the gas exceeds a certain limit—



Glover and West's Gas Off-Take Pipes for Vertical Retorts.

the sound being caused by the flowing gas. The device is to be used to give a signal as soon as the flow of gas in a pipe exceeds a certain predetermined limit—*i.e.*, to show whether too much gas is passing.

The device is especially intended to indicate in incandescent gas-burners by a sound when more gas flows to the burner than is necessary for obtaining the best lighting effect, and to prolong this sound until it is stopped by regulating the cock or by reducing the gas pressure. In this way "an important saving in gas and an improvement in the general lighting effect can be obtained, because only a certain amount of gas is necessary for obtaining the best lighting effect, and an increase in the gas consumption does not produce an increase, but a material decrease, in the lighting effect, which is often not noticed."

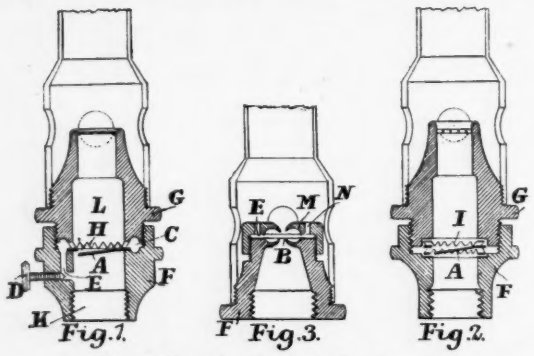
The device is constructed in the form of a membrane provided with a vibrating tongue, or of a whistle; and it is preferably provided with means for regulating the moment at which the sound is produced. [Further details are not needed, in view of patent No. 24,568, which follows.]

Adjustable Signalling Device for Gas-Pipes.

MEYER, F., of Aix-la-Chapelle.

No. 24,568; Nov. 4, 1911. Date claimed under International Convention, Oct. 3, 1911.

Like patent No. 24,567 [see above], this invention relates to a signalling device for incandescent gas-burners, which is operated by the current of gas, and comes into action when a certain amount of gas passes—*i.e.*, when more than a desired amount of gas flows through the pipe or through the burner. If, for instance, the burner has a normal gas consumption of 100 litres per hour, then, at an excess consumption of (say) 102 litres, a signal is given, which can only be stopped if the gas consumption is reduced again to or below 100 litres per hour, either by decreasing the pressure in the pipe or by adjusting the cock.



Meyer's Signalling Device for Gas-Burners.

Of course, each type of burner requires a different amount of gas for giving the highest lighting effect; and so it is necessary either to build for each burner type a special model, in which the commencement of the signalling action depends, for instance, on the thickness of a vibrating membrane or on the position of the vibrating tongue, or else to make the commencement of the alarm signal variable by adjustment. According to the present invention, the adjustability is obtained by dividing the gas current and then only leading one part of the current through the device; the part remaining in each case being led past the device without influencing it.

If, for instance, in a burner the best lighting effect is obtained with a consumption of 80 litres of gas per hour, the signalling device may be so constructed that it begins to sound when 40 litres pass through it, whereas the remaining 40 litres are passed round the signalling device. If the same device should, however, be applied for a burner in which the best lighting effect is obtained with a gas consumption of 100 litres, still 40 litres would be passed through the signalling device, whereas 60 litres would go through the bye-pass arrangement, which, for this purpose, is made regulable.

According to fig. 1, the alarm signal consists of a round sheet-metal disc with partly stamped-out tongue A. The disc is placed between two superimposed connecting pieces F G, of which the lower has an inner screw-winding fitting on the gas-pipe, whereas G forms in its prolongation the burner-nozzle. The lower connecting piece is provided with a canal E terminating at its lower end in the main gas-passage K and at its upper end in a circular canal C, from which the gas can pass, through openings H, into the upper gas-canal L. The passage of the canal E can be regulated by an adjusting screw in such a manner that more or less gas can pass through it to the canal C, and thence to the openings H into the passage L.

In fig. 2, the membrane, provided with the tongue A, is placed between two circular corrugated rings I. These rings are placed between the connecting pieces F G, and hold the membrane between them. The connecting pieces leave an annular passage around them; but the size of this passage can be varied according to whether the connecting pieces are screwed further apart or closer together. In this construction, part of the gas passes through the membrane and another part passes around it; the latter part being regulable by adjusting the connecting piece G.

Fig. 3 shows a form of the invention in which the signalling device consists of a whistle B, the lower part of which is formed by shaping the upper portion of the connecting piece F, on to which a cap M is screwed which carries the upper part of the whistle. The cap is also provided with a canal N, which forms a part of the bye-pass. In this construction, part of the gas flows through the centre opening of the whistle, whereas part flows through the space E left between the connecting piece F and the cap M, and from there to the canal N. The latter part can be regulated by screwing the parts F and M further apart or closer together.

Combined Gas and Coal Stove.

PELSMAEKERS, A., of Brussels.

No. 26,269; Nov. 23, 1911. Date claimed under International Convention, May 31, 1911.

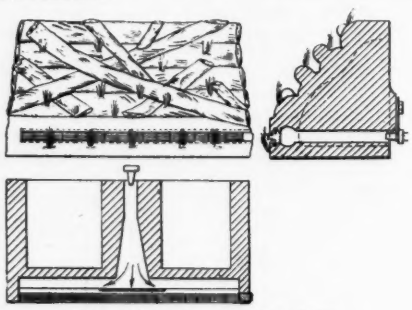
This invention relates to stoves for domestic use, wherein a gas-stove and a stove burning coal are mounted upon a rotatable support so that they can be used alternatively. The invention consists in forming the rotatable support of the stoves with a circular apertured part at the top, by means of which it is guided in an opening in a plate closing the stove at the top. Another improvement consists in providing a space for the circulation of air, from the room to be heated, behind the coal-stove—that is, between the latter and the gas-stove. Yet another improvement consists in constructing the rotatable support so the part of it reserved for the coal-fire "forms a seat or chair upon which a portable fire-bucket can be placed—no permanently fixed grate being in this case used."

Gas-Heating Stoves.

PELSMAEKERS, A., of Brussels.

No. 27,298; Dec. 5, 1911. Date claimed under International Convention, Aug. 8, 1911.

This invention relates to blocks of refractory material; used in connection with gas-stoves "to give the appearance of burning logs of wood, coke, or the like."



Pelsmaekers' Gas-Heating Stove.

The suggested arrangement will be appreciated from the illustration showing a front view of the complete apparatus, a vertical section, and a horizontal section.

The block of refractory material has in front suitable ornamentation constructed of refractory earth—for example, imitation wood logs placed crosswise and suitably arranged. These logs, instead of being perforated (as usual) with discharge orifices for the gaseous mixture, constitute merely absorption surfaces for the heat. The discharge of gas can only take place in the lower part of the apparatus—preferably through a longitudinal aperture placed as low as possible in the lower refractory part. As it is impossible to obtain, by direct perforation of the lower part with small holes, a discharge area suitable for the quantity of gas admitted to the apparatus, the discharge of gas takes place directly through the longitudinal aperture, which is covered with a metallic net formed of longitudinal wires held or interconnected by short transverse wires, sliding directly into slots or channels formed in the upper and lower walls of the slot or channel. The supply of gas to the channel is effected by a conduit behind the net, through a transverse conduit having at its end the air-inlet and gas-injector. Under these conditions, the gaseous mixture tends to escape directly through the net at the part opposite the conduit. The net therefore is used in conjunction with a separate distributer, consisting of a perforated metal plate placed opposite the conduit and extending a suitable distance "so as to form an additional obstacle to the direct passage of the gas and to ensure the flow thereof to the lateral parts of the horizontal conduit."

Removing Carbon Disulphide from Gases.

KNOEVENAGEL, E., REIS, J., and KUCKUK, F., of Heidelberg, Germany.

No. 3043; Feb. 6, 1912. Date claimed under International Convention, March 4, 1911.

The patentees point out that the greater part of the organic sulphur compounds contained in gases consists of carbon disulphide; and the processes hitherto employed for the removal of these compounds have therefore been based on the removal of the carbon disulphide, "but so far without any practical results." They therefore propose to employ an absorption process (including a chemical combination) which can be carried out at ordinary temperatures. It consists in bringing the gas into contact with alkali-cellulose either alone or mixed with lime; "it being preferable to first remove the carbon dioxide and hydrogen sulphide from the gases as far as is possible in any well-known or suitable manner."

In carrying out the process, cellulose-containing material (such, for instance, as sulphite-cellulose and the waste products therefrom) or saw dust, rags, cotton, cotton waste, and the like are converted into the alkali-compound of the cellulose; the carbon disulphide present in the gases combining with this compound to form cellulose xanthate, which can be utilized in any suitable manner. This purifying mass is, owing to its porous nature, especially adapted to provide a free passage for the gas, as well as offering as large an absorbing surface as possible to the carbon disulphide.

The gas so obtained is free from carbon disulphide; and if the usual purification of the gas from hydrogen sulphide is also effected, "the

gas gives off almost no sulphur dioxide on burning." In this manner, among other advantages, the illuminating and calorific power of the gases is said to be increased, while the specific weight is reduced, "so that the gas is rendered more suitable for inflating balloons."

As an example of the process suggested: An illuminating gas deprived of carbon dioxide and hydrogen sulphide in the usual manner, or any other similar gas which, owing to the nature of the initial product, still contains large amounts of carbon disulphide, is passed through apparatus containing alkali-cellulose in any form—obtained in the known manner by the action of alkali-lye upon cellulose; the excess of alkali lye being removed after action on the cellulose has taken place for the required length of time. If a gas containing carbon disulphide be caused to react at ordinary temperature on the alkali-cellulose thus produced, the intimate contact of carbon disulphide with the alkali-cellulose gives rise to cellulose xanthate which, on being dissolved in water, yields the so-called viscose, which can be utilized in any suitable manner.

As a good test for ascertaining the degree of purity of the gases, triethylphosphine may be employed which, combining with any carbon disulphide still present, yields a compound which crystallizes in fine ruby-red prismatic crystals.

Recording the Percentage of Carbon Monoxide in Gaseous Mixtures.

LEVY, L. A., of Hampstead, N.W.

No. 12,841; May 29, 1911.

This apparatus for automatically recording the percentage of carbon monoxide in a gaseous mixture, will, if required, simultaneously record the percentage of carbon dioxide in the mixture.

The gaseous mixture from the source of supply is led through suitable piping to an absorbing vessel containing a reagent, which absorbs any carbon dioxide present. The gas is then led to a vessel containing an oxidizing reagent. In passing through this vessel, the carbon monoxide in the mixture is oxidized to an equal volume of carbon dioxide. A suitable reagent for the purpose is anhydrous iodine pentoxide; but the patentee does not confine himself to the use of this reagent. Palladium is used as a catalytic agent in cases where there is an excess of free oxygen in the gaseous mixture sufficient to oxidize the carbon monoxide. The oxidizing reagent or the catalytic agent and its containing vessel may be heated to a convenient temperature; and the oxidized gas is then led to a CO_2 recorder of any type in which a graph is automatically drawn so as to show the percentage of carbon monoxide present in the original mixture.

When the apparatus is required to record simultaneously the percentage of carbon dioxide in the gaseous mixture, the gas is passed through a CO_2 recorder, which gives the record of the percentage of this gas in the original mixture. Another portion of the gas is passed through a vessel containing the oxidizing reagent, and the percentage of carbon dioxide in the oxidized gas is recorded on another CO_2 recorder. The difference between the percentage shown on the two records is the percentage of carbon monoxide. Or after passing the gas through the first CO_2 recorder, it may be drawn successively through a vessel containing the oxidizing reagent and through another CO_2 recorder; the record given by the latter being that of the carbon monoxide originally present in the gaseous mixture. In passing through the first CO_2 recorder the gas has been deprived of any carbon dioxide, but the carbon monoxide is not affected.

Suitable apparatus may be provided to remove, if necessary, by absorption or otherwise, any unsaturated hydrocarbons before the gas is oxidized.

APPLICATIONS FOR LETTERS PATENT.

10,099.—CREIGHTON, H., "Taps or cocks." April 29.
10,125.—BROWN, J. R., "Taps and valves." April 29.
10,142.—WOODS, E. J., "Mantle boxes." April 29.
10,147.—FELD, W., "Production of sulphur and sulphates from polythionate solutions." April 29.
10,151.—WILTON, G., "Sight-feed apparatus for indicating the flow of liquids." April 29.
10,211.—CARRUTHERS, F. J. C., "Carburetting air." April 30.
10,236.—BARRALET, T. E., and PARKINSON STOVE COMPANY, LTD., "Geysers or water-heaters." April 30.
10,289.—PEEBLES, W. C., "Gas-governors." May 1.
10,326.—CLEAVER, H. C., and BOSWALL, A., "Gas-fires." May 1.
10,371.—SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., "Atmospheric gas-burners." May 1.
10,377.—HUGHES, G., "Economizer for gas-stoves." A communication from M. S. Barnet. May 1.
10,410.—SAMUEL GRATRIX, JUN., and BRO., LTD., and HIGGINS, T., "Anti-vibration device." May 2.
10,454.—THOMAS, C. C., "Measuring the rate of flow of liquids." May 2.
10,461.—HERSEY, M., "Mantles." May 2.
10,473.—RESTLER, J. W., "Liquid meters." May 2.
10,571.—ROBINSON, S., "Coin-freed gas-meters." May 3.

Doncaster Gas-Works Extensions.—The Doncaster Corporation recently applied to the Local Government Board for sanction to the borrowing of £33,000 for gas-works extension, this sum to include the erection of certain buildings. Information has now been received that the Board have declined for the present to sanction a loan for the latter work, but have agreed to the Corporation borrowing £24,500, which amount will include the cost of a new holder, condensers, scrubbing plant, tar extractor, purifier, boiler, and prospective expenditure on mains, meters, and public lamps. The time granted for repayment of the loan is thirty years for the holder, and periods varying according to the lifetime of the plant for the other items.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Ashborne Urban District Council (Gas) Bill, Birmingham Corporation Bill, Gas Orders Confirmation Bills (No. 1, to confirm Orders relating to Conisbrough, Elham Valley, Nottingley, and Thurles Gas, and No. 2, to confirm Orders relating to Cambridge, Cleethorpes, Tipperary, and Welwyn, Knebworth, and District Gas), Tavistock Urban District Council Bill, Water Orders Confirmation Bill (to confirm Orders relating to Chiddingfold and District, East Surrey, Henley-on-Thames, and Wimborne Minster Water).

Bills reported: Brighton and Hove Gas Bill, Church Stretton Urban District Water Bill, Christchurch Gas Bill, Derwent Valley Water Bill, Dunstable Gas and Water Bill, Herne Bay Gas Bill, Lea Bridge District Gas Bill, Llanelly Rural District Water Bill, Maidenhead Gas Bill, North Middlesex Gas Bill, Southgate and District Gas Bill, Swanage Gas and Water Bill, Ystradfellte Water Bill.

Bills read the third time and passed: Bawtry and District Gas Bill, Brodsworth and District Gas Bill, Lea Bridge District Gas Bill, Maidenhead Gas Bill, North Middlesex Gas Bill, Southgate and District Gas Bill, South Suburban Gas Bill, and Ystradfellte Water Bill.

The East Grinstead Urban District Council have presented a petition against the Gas Companies (Standard Burner) Bill; and the Alkali Manufacturers' Association against the Birmingham Corporation Bill.

The opposition to the Bordon and District Gas Bill, the Houghton-le-Spring District Gas Bill, and the Llanelly Water Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Bawtry and District Gas Bill [Lords], Brodsworth and District Gas Bill [Lords], Lea Bridge District Gas Bill [Lords], Local Government Provisional Orders (Gas) Bill, Maidenhead Gas Bill [Lords], North Middlesex Gas Bill [Lords], Southgate and District Gas Bill [Lords], South Suburban Gas Bill, Ystradfellte Water Bill.

Bills read a second time: Gas and Water Provisional Orders Bill, Kilmarnock Gas Provisional Order Bill.

Bills reported: Dover Corporation Bill, Fylde Water Board Bill, Keighley Corporation Bill, Scunthorpe Urban District Water Bill, Sidmouth Urban District Council Bill, Shipley Urban District Council Bill, Tendring Hundred Water and Gas Bill.

Bills read the third time and passed: Ashborne Urban District Council (Gas) Bill, Birmingham Corporation Bill, Ivybridge Urban District Water Bill, Leatherhead Gas Bill, Tavistock Urban District Council Bill.

INDUSTRIAL UNREST AND ITS PREVENTION.

The Value of Co-Partnership.

The House of Commons was occupied again last Wednesday evening with the question of the prevailing industrial unrest and the means to be adopted to prevent or mitigate it. In the course of the debate, which had to be adjourned at eleven o'clock (in accordance with the rules of the House), several references were made to co-partnership as a possible remedy.

Mr. CRAWSHAY-WILLIAMS introduced the subject by moving—"That this House is of opinion that the recent industrial disturbances show the necessity of a thorough and authoritative investigation into the causes of the present industrial unrest, and into possible remedies therefor, and, in view of the prospective recurrence of such disturbances, calls upon the Government to prosecute such investigation by all appropriate means, and in the speediest manner compatible with adequate inquiry into the issues involved." He emphasized the gravity of the problem facing the country by recalling the recent strikes among miners, seamen, and transport workers, railway men, cotton workers, tailors, and the symptoms indicated by the Syndicalist prosecutions. The state of industrial unrest in this country as well as abroad was, he said, as unprecedented as it was ubiquitous. It was mainly a struggle on the part of the workers for better conditions—a deliberate revolt against the untrammelled nature of wealth-getting; and in itself this was not a bad thing. The symptoms only were bad; and the problem was how to give labour its due without the creation of these industrial upheavals. Hasty and ill-considered legislation might do more harm than good; it was needful not to move too hastily until the results of the experiment in fixing a minimum wage were revealed. There should be a speedy inquiry, for the country was threatened with another coal strike, another railway strike, and more trouble in the cotton trade. As to the remedies that were put forward, there was the remedy of Tariff Reform. He would be glad to see an inquiry into the effect of Protection on real wages; for he was perfectly certain that it would be shown that it would only do harm to the workers. Then there was the remedy of the right hon. gentleman the member for the City of London (Mr. Balfour), who thought the hopes for the future lay in education. This was another point that might be submitted to inquiry. Then there were the remedies of compulsory arbitration and the nationalization of monopolies—the chief remedy advocated by hon.

members below the gangway; and the extension of the principle of the minimum wage, each and all of which required elucidation, and should form the subject of inquiry. Lastly, there was the question of co-operation and co-partnership. There never yet had been any real consideration of the practical details of co-operation in different industries, and further information was needed. It was desirable that the inquiry should be searching, and yet not too long. Perhaps it would be possible to set up a series of Special Committees to inquire simultaneously into different branches of the subject.

Mr. WHYTE seconded the motion. He said the present industrial unrest was, in the main, the outcome of the conjunction of two forces which had their origin in the Nineteenth Century—first, the accumulation of wealth on a scale and at a pace never before attained; and, secondly, the access, through education, of the people of the country to economic doctrines, good, bad, and indifferent. It was a search on behalf of the industrial classes for an answer to the question of how to live.

Lord ROBERT CECIL agreed that industrial unrest was widespread, extending far beyond this country; and the practical question was what was its cause and what could be done to remedy it. The cause was the demand for better terms for labour, which might have been increased by improved education. He did not believe that the remedy lay in the grant of a minimum wage. The present system was based on bargain; and any rash and violent interference with bargaining on either side would not be of any advantage to the working classes or the employers. What was really necessary was a better division of the profits of industry. He and some of his friends asked last November for an inquiry into the question of co-partnership. The Government were still, after six months, in the stage of considering the matter. He was not complaining; but this was not an encouraging result of an attempt to get an inquiry. As to the chronic side of the industrial unrest, the only hopeful remedy yet suggested was co-partnership. Unless Capital and Labour could be induced to work more closely, the whole industrial system of the country would be in danger.

Mr. KEIR HARDIE said there was a chance for the noble lord and his friends to show their faith in co-partnership, because there could be no better field for its operation than the land. Let the landowner, farmer, and labourer come together. But co-partnership would not prevent strikes. In his opinion, the proposed inquiry would be no good. The Labour Party objected to any Special Committee or Royal Commission being appointed to inquire into labour questions. If any such make-believe body was set up, no working-class organization would appear before it. He moved an amendment to the effect that the only remedy for the prevention of industrial unrest was by legislation securing the right to work, a maximum eight-hours working day, a minimum living wage, and nationalization of railways, mines, and other monopolies.

Mr. J. H. THOMAS seconded the amendment.

The CHANCELLOR OF THE EXCHEQUER said industrial unrest was not a new problem, and it had been with us more continuously during the last hundred years than in any other period. Wherever one went in the industrial world, one found unrest. To what was it attributable? There was no difference of opinion as to the premises between the noble lord (Lord Robert Cecil) and the member for Merthyr Tydvil (Mr. Keir Hardie). They agreed that there was dissatisfaction with the conditions of life among the working classes—a feeling that they were not getting a fair share of the general prosperity. The difference was with regard to the remedy; and he was struck with the very slight difference as to the general principle even of the remedy. The noble lord said his was to give the workmen a fair share of the profits. This was coming pretty near to the Syndicalist doctrines in principle. It carried them very far indeed. The particular remedies which had been suggested were a minimum wage, the nationalization of railways, and co-partnership. Was his hon. friend the member for Merthyr Tydvil quite sure that the nationalization of railways would put an end to strikes on railways? They had nationalization of railways in Germany; but wages there were much lower than here. The noble lord had suggested co-partnership. He, personally, would not rule-out co-partnership as a subject for inquiry, and he had invited the noble lord to co-operate. It was in an experimental stage. There were cases where it had been adopted with a large measure of success; but there were others which indicated failure. The Government wished to find out why this was so. Hasty conclusions ought not to be formed; and in the meantime they should apply such remedies as were available to the Government to deal with the temporary outbreaks which were inevitable in our economic condition at the present time.

CHEMICAL & TUNNEL CLAUSES & UNOPPOSED BILLS.

The Unopposed Bills Committee of the House of Lords considered, among others, the following Unopposed Bills last Tuesday. In the course of the proceedings, the chemical clause and also one relating to the laying of mains in tunnels cropped up.

DUNSTABLE GAS AND WATER BILL.

The Bill promoted by the Dunstable Gas and Water Company proposes new works in connection with the water undertaking, and certain modifications of existing powers in relation to the gas undertaking, such as a reduction of candle power to 14 candles, the supply of gas in bulk, pressure, &c. No new gas capital was proposed. Since the Bill was deposited, the following new clause has been inserted:

RESTRICTION ON MANUFACTURE.

Notwithstanding anything in this or any other Act relating to the undertaking of the Company, the Company shall not purchase or use in any process of manufacture any materials other than those required for the making and supply of gas by them, or for the working-up of their own residual products, or for the construction, maintenance, and repair of their gas-works plant or buildings, or for the maintenance or repair of gas-fittings.

WINDERMERE DISTRICT GAS AND WATER BILL.

In connection with this Bill, which only proposes additional water-w orks and the raising of capital in this connection, it had been suggested by Mr. Gray (Counsel to the Lord Chairman) that the chemical clause should be inserted. It was explained to the Lord Chairman, however, that this Company had not the stock clause enabling them to purchase and sell fittings, so that the insertion of the chemical clause, which gave powers to the Company to maintain and repair gas-fittings, would be somewhat anomalous, as they would be authorized to repair and maintain things which they had not power to purchase. It was therefore asked that the clause should not be put upon the Company in its present form. Mr. Gray suggested that the Company might insert in the Bill the Model Clause relating to the purchase and supply of fittings; and eventually it was arranged to have a conference with the promoters on this point.

HERNE BAY GAS BILL.

This Bill proposes the increase of the Company's capital by £10,000, the creation of a special purposes fund and a reserve fund, and placing the Company upon the sliding-scale basis; the standard price being 3s. 9d. Section *a* of clause 2 modifies the Gas-Works Clauses Act, 1847, in respect of giving the Company authority to treat any tunnel, arch, vault, or building beneath the surface of any street as a tunnel for the purposes of laying mains. This raises the point already mentioned in our "Parliamentary Intelligence" in connection with the Christchurch Gas Bill, and deals with the difficulty which arose in the case of *Schweder v. Worthing Gaslight Company*. The Lord Chairman, however, stated that, in his opinion, cases such as this were very unlikely to arise in the future, so that the amendment was really unnecessary. If, however, similar cases did arise, it would be necessary to reconsider the matter from the point of view of general legislation. The clause was consequently struck out of the Bill.

WAKEFIELD GAS BILL.

HOUSE OF LORDS COMMITTEE.—Monday, May 6.

(*Before Lord* BARNARD, *Chairman, Lord* FALKLAND, *Lord* BRABOURNE, *Lord* AMHERST, *and Lord* ORANMORE AND BROWNE.)

As briefly recorded in the "JOURNAL" last week at the conclusion of our report of the proceedings on this Bill (*ante*, pp. 380, 381), the Committee to-day passed the preamble.

Counsel for the Bill were Mr. HONORATUS LLOYD, K.C., Mr. CLODE, and Mr. A. M. PADDON. The opponents of the Bill were the Wakefield Corporation, represented by Mr. VESEY KNOX, K.C., and Mr. RALPH BURY, and the Stanley Urban District Council, represented by Mr. WEDDERBURN, K.C.

The following further evidence was heard.

Mr. *E. H. Stevenson* was called on behalf of the Wakefield Corporation and the Stanley Urban District Council. He said there was no necessity for the Company to go to Woolley, as it would put additional cost upon the consumers in Wakefield, because there was no population there worth speaking of. The supply could never be as remunerative as in the rest of the area; and if the Company were granted the extended district, a higher price should be charged there. He did not like the conversion of capital at all, because it would take away from a large number of shareholders any interest in a reduction of price—*i.e.*, the maximum-price shareholders would not have the interest in this direction that the sliding-scale shareholders had. The Corporation attached the utmost importance to the proposed increased capital powers of £106,000, in addition to the unissued capital of £12,000. On this point, he had taken out figures of the rate of increase of gas consumption generally during the past thirty years; and these showed that it was a decreasing rate of increase. During the first ten years of the thirty-year period, the rate of increase was 4·19 per cent.; during the next ten years, it was 1·8 per cent.; and during the last ten years, it was only 1·68 per cent. He saw no reason for a more rapid increase in the future. The rate of increase adopted by the Company would give them immunity from coming to Parliament for the next thirty years at least. He did not agree with the evidence of Mr. Woodall that there would be any diminution in the competition by electricity in the future; indeed, in his opinion, electricity and gas had very different spheres—the former appealing to the better class and gas to the poorer classes, who want heat as well as light. There was no necessity to have storage capacity for a whole day's make. The present storage capacity was ample for all likely requirements during the next fifteen years. The existing holders were 29 per cent. in excess of what he regarded as necessary, and actually would hold 472,000 cubic feet more than the present day's supply. Similarly, the retort capacity was 42 per cent. in excess, and purifiers 50 per cent. in excess of what was required to-day. The washing apparatus was also in excess. In order to be generous to the Company, he had allowed a 2 per cent. compound increase during the next fifteen years; and upon this basis, the Company would be selling 94,000,000 cubic feet additional to what was supplied in 1910. The existing plant and holders were capable of dealing with this, except, perhaps, that one of the gasholders might be enlarged, the additional capital cost of which should not exceed £2000. This was the only capital expenditure on works necessary. The remaining £48,000 of the £50,000 which the Corporation asked should be granted to the Company would be available for distributing mains. The new capital should be raised by means of loans, as this would carry the smallest possible capital charge against the consumer—this view being based on the fact that in the past the Company had issued share capital instead of loan. His suggestion would equalize matters. He also complained that the Company had in the past issued their capital in large lots, which rendered it unattractive to anybody except the existing shareholders. Dealing with the expenditure on capital account out of revenue, he said that this had kept the price up. But for this, gas could have been supplied at 2s. per 1000 cubic feet; and had the capital been raised in the ordinary way in the past, the price could have been 1s. 9d. or 1s. 10d. All undertakings in Yorkshire with an output of 100 million cubic feet per annum charged lower prices than at Wakefield, with but two exceptions—viz., the Shipley

Corporation and the Barnsley Gas Company. Nevertheless, Wakefield was exceptionally well situated for cheap production. This undertaking was the only one he knew of where the price of gas had not fallen appreciably during the last 25 years; the price here having remained at 2s. 6d. since 1880. Last year repairs and maintenance cost 1s., which was exceedingly high, due to extensions of meters, fittings, services, and stoves, which undoubtedly should have come out of capital. The standard price of 3s. 6d. was excessive. Under present-day conditions, he would ask for 2s. 2d. or 2s. 3d. if the Company were a new one. If, however, the standard price were reduced to 3s., the Company could still pay the same dividend as at present, and could also pay the dividend which they gave up to-day; but it was clear that the Company did not intend to make use of the standard price to increase the dividend to the full. Therefore, in the interests of the consumer, the standard price should be reduced. On the question of testing, he asked that the Corporation should have the right to test at any reasonable hour of the day, on account of the fact that the Company enriched their gas by the benzol process. If the Corporation had to test at certain hours, such as prescribed under the Gas-Works Clauses Act, the Company would be able to turn on the enriching process, and keep the gas up to quality during these hours.

In cross-examination by Mr. CLODE, witness said he did not pretend to have solved the capital conversion problem while retaining all the existing rights. Neither would he agree that the Company had been greatly restricted in their output for domestic and industrial purposes by reason of the equality of price clause. It was a well-known fact that the maximum output of all gas-works had fallen in proportion to the annual output, unless the condition of things had changed very materially. This was the reason why, in this case, extensions of works were unnecessary.

The CHAIRMAN: The reduction in the capital you suggest, Mr. Stevenson, is very large.

A long cross-examination followed on the question of reducing the standard price; witness being reminded of his evidence in the case of the Lea Bridge Bill, when he stated that only in very exceptional cases should the standard price be reduced. He contended the present case came within this category. There was very little demand in Wakefield for gas for power purposes; hence there was no necessity for having a differential price for power supply.

Mr. VESEY KNOX, for the Wakefield Corporation, said he would be content with the hours of testing granted in the case of York. He had made this offer; and although he knew he was not pleasing his clients, he would not go back on it. He also claimed that every well-conducted gas company should give a pressure of 20-10ths at every point in their district. The provision of the Model Bill, which prescribed 8-10ths, clearly did not meet modern requirements, as tests for pressure were now more important than tests for illuminating power. He asked that the Wakefield Corporation should be given the most favoured clause with regard to the price of gas for street lighting, in the event of the Committee granting the differential price as between domestic and industrial supply—*i.e.*, the Corporation should always be charged the lowest price charged to any other consumer. In connection with the conversion of capital and standard price, Counsel said that if the Committee gave the Company the basis of conversion which they sought, the Corporation would be met by the Committee either leaving the standard price at 3s. 6d. and making the slide 2s. 6d. instead of 5s., or making the standard price 3s and the slide 5s.—he did not care much which. Arguing that the price had been kept up unduly by reason of the capital expenditure met out of revenue, he said the price had also been influenced by the method of raising capital in the past. Only £13,000 of premiums had been received upon £50,000 since 1877. Having regard to the very high dividends, they ought to have received much more in premiums. As to the conversion, it was argued that the 7 per cent. shareholders would have to give up some of their rights unless the scheme suggested was adopted. In every case of such conversion, shareholders had to give up something; but he did not think it right to force them to do so. Therefore he did not press his objection to the conversion scheme *per se*; but he did ask the Committee to bear in mind that this was giving the Company an important concession, something more than other companies got.

Mr. CLODE then addressed the Committee in reply on behalf of the promoters. The Company, he said, could not support the suggestion for charging a different price in Woolley, because the arrangement with that district was that there should be the same charge. Further, the Company were at the moment actually supplying in other districts outside at the same price as inside. Therefore, he left the matter in the hands of the Committee. It was agreed that the Company should have the additional lands asked for; the only point outstanding being whether the footpath should be converted into a roadway or not. He laid stress upon the fact that the conversion scheme merely kept the rights of the shareholders precisely as at present, both as to earning power and capital value; and he failed to see that any valid criticism had been made against the proposal of the promoters. A similar remark applied to the proposed new capital. The Company knew what they would want in the future; and he asked the Committee to adopt the basis upon which the Company had worked. Surely the responsible officers of the Company, living on the spot, must know more about a purely local matter, such as this, than could a gentleman living in London, and who visited Wakefield occasionally. No case had been made against the Company which entitled the opposition to ask for any penalty in regard to the standard price. The shares of the Company had been subscribed on the strength of the standard price of 3s. 6d.; and why should the old shareholders suffer? No new sliding-scale capital was asked for. All the new capital was maximum capital; and therefore it was penalizing the old shareholders who had invested on the basis of the standard price. The only argument seemed to be that the Company were not distributing all that they might by way of dividends. He asked that the standard price be not altered; quoting the Bromley case—where the standard price was 4s. 6d., and the Company were paying 30s. below the standard dividend, and yet the standard price was not altered. As to the question of pressure, he asked the Committee to adhere to the Model Clause—viz., 8-10ths. A difference in level of 10 feet made a difference of one-tenth; and in Wakefield, the maximum difference in height would make a difference of two or three inches, which might involve a dangerous pressure.

This completed the hearing; and the Committee's decision, as given in our last issue, was announced.

The Corporation were unsuccessful in their request that the Company should convert the footpath, which will be diverted in consequence of taking new land, into a roadway.

WOKING GAS BILL.

HOUSE OF LORDS COMMITTEE.—Tuesday, May 7.

(*Before Earl* BRISTOL, *Chairman, Lord* HARDWICKE, *Lord* GWYDIR, *Lord* RAVENSWORTH, *and Earl* EGMONT.)

This Bill proposes to convert the existing Company into a statutory Company; to grant additional capital and borrowing powers; to apply the sliding-scale and other features of modern gas legislation, involving the fixing of the standard price, illuminating power, and method of testing; and to adjust and increase the area of supply, and extend the works.

Mr. VESEY KNOX, K.C., and Mr. A. M. PADDON appeared for the promoters. The only opponents were the Woking Urban District Council (represented by Mr. C. C. HUTCHINSON, K.C.) and the Surrey County Council (represented by Mr. J. G. TALBOT, K.C., and Mr. JEEVES). The latter, however, was only a clause opposition. The United Alkali Manufacturers' Association originally presented a petition against the Bill; but this had been withdrawn upon the insertion of the chemical clause which Lord Ritchie's Committee put in the South Suburban Gas Bill.

Mr. VESEY KNOX, in opening for the Bill, said that the Company were granted a Provisional Order in 1891 for Woking and some of the surrounding districts. The original capital was £16,000, in 10 per cent. stock, with one-quarter borrowing powers. The maximum price was fixed at 5s, with power to the Board of Trade to fix a sliding-scale, which, in fact, had not been done. In 1901, the capital of the Company was increased to £20,000, and the additional capital—which was to be 7 per cent. capital or 5 per cent. preference stock—had to be issued under the auction clauses. In 1901, another Order was granted, giving further capital powers to the amount of £30,000, also to be issued under the auction clauses. The Company had raised altogether £16,000 of the original 10 per cent. stock, £20,000 of 7 per cent. stock, and £25,000 of 5 per cent. preference stock—the total being £70,200; the difference being made up by a mortgage. The fortunes of the Company, from the financial point of view, had been rather chequered. They were not among those gas companies who had given uniformly high returns to the investor; the average being about 4 per cent. on the capital expended. The scattered nature of the district had always told against the Company. In recent years, they had also had to face a good deal of electrical competition. In one year they did pay the full 7 per cent. on the 7 per cent. capital; but this was for one year only. In 1904, the London and South-Western Railway Company, who took about a third to a quarter of the Company's total make of gas, unfortunately adopted electricity; and by one stroke they lost a consumer who was responsible for a very considerable part of the output. Consequently, it became necessary to devise means for making up this loss. A large sum of money had been spent in slot meters; and there was now a very unusual proportion of small consumers, who, in the aggregate, had more than made up for the loss of the Railway Company's custom. Unfortunately, however, the profit was not so great; and they had never been able to get up to the financial position they were in previously. In 1905, a dividend of 5 per cent. was paid. Then another misfortune befell the Company—a new carbonizing plant which had been installed not proving satisfactory. There was also excessive leakage in the mains; and the Company got into an unfortunate position. Mr. Phillips was called in to advise the Company in 1907. He proposed a very drastic process of reconstruction; and the Company, acting upon his advice, reconstructed out of revenue all the furnaces and retort-beds which were installed in 1905. This cost amounted to £2533. As a consequence, dividends were reduced in 1907 to 2 per cent.; while nothing at all was paid in 1908. The preference dividends had been covered, however; and last year they were able to pay 5 per cent. on the ordinary shares. It was now hoped that the Company would continue steadily progressing. Every effort had been made during this period to serve the consumers; and, in spite of the unfortunate position of the Company, the price of gas had been steadily brought down. It was 4s. 9d. per 1000 cubic feet in 1901 and 4s. in 1910; while very considerable discounts were allowed for comparatively small amounts of consumption—this in the case of prepayment meters, which was an unusual feature. The result was that the average price was less than 4s.; and considering the very scattered nature of the district, he thought the Committee would be satisfied that this was a reasonable price. Out of 3371 consumers, 2129 were penny-in-the-slot and 345 were shilling-in-the-slot consumers. No less than 75 per cent. of the total consumers were slot-meter consumers. The consumption in 1907, when Mr. Phillips was called in, was 24 million cubic feet; but this had risen to 61 millions in 1911. The Company had now come to an end of their capital powers, and the question was as to how much should be allowed. The estimates which had been prepared by the engineers seemed to show that the amount asked for in the Bill would not carry the Company on for more than twelve or thirteen years; whereas the usual capital powers granted in cases of this sort were sufficient to carry the Company on for fifteen years. The auction clauses would be applied to the new capital. The standard price in the Bill was 5s.; but he proposed now that it should be 4s. 6d., although apparently this was not sufficient reduction to meet the opposition of the Woking Council. The principle of Parliament was to fix a standard just above the price at present charged. Therefore, he was entitled to have asked for a

higher price, especially in view of the fact that the present was an anxious time for gas companies, owing to the uncertainty of the future price of coal and the unrest in the labour world. Further, as a maximum-price Company, they were entitled to repay all the unpaid back-dividends, which now amounted to a very large sum of money. By desiring to become a sliding-scale Company, however, they gave up all claim to these back-dividends; and he ventured to suggest to the Woking Council that the maximum price should be fixed with reasonable generosity, in order to compensate the shareholders for this considerable sacrifice. The illuminating power was to be fixed at 14 candles instead of 15. The Woking Council did not object to this, provided they had a *quid pro quo* in price; but he failed to understand their position in this respect at present. The petition of the Council asked that additional capital sufficient for only twelve years should be granted, and that the standard price should be considerably reduced. They also objected to the Company taking certain additional lands between their gas-works and the Basingstoke Canal, and referred to a number of other things—more matters of clause than preamble.

Wednesday, May 8.

When the proceedings were resumed this morning,

Mr. HUTCHINSON, on the suggestion of the CHAIRMAN, decided to treat his opposition as a clause opposition.

Mr. *E. L. Burton*, the Secretary of the Company, was thereupon called, and formally proved the preamble of the Bill.

Clauses were then gone through.

Mr. HUTCHINSON, in regard to clause 20, dealing with new capital powers, asked that the total new capital, both share and loan, should be £60,000. The Company were really asking for £80,566 new capital, which, in his view, would enable them to continue for 23 years.

Mr. VESEY KNOX explained that Mr. Hutchinson was under a misapprehension as to the amount of capital asked for under the Bill. The Company had issued capital to the extent of £59,785, and there were certain premiums which brought the total up to £61,210. The unissued capital powers went, consequent on the change in the constitution of the Company. The amount asked for was the difference between the issued capital and £105,000, which, together with the borrowing powers, made £71,000—not £80,566 as had been stated by Mr. Hutchinson.

The Committee decided to grant the capital powers asked for.

Mr. HUTCHINSON's next clause opposition was with regard to new lands. At present, the Company's works were separated from the Basingstoke Canal by a strip of Horsell Common, over which a tramway runs for conveying coal from barges. The Company desired to acquire this land for the purposes of the works, and also to erect a gantry on the canal. The Woking Council wished to preserve the public rights over this portion of the Common, and suggested that other lands, equally suitable, were available.

The Committee, after a long discussion, refused to authorize the acquisition of the land, but gave the Company statutory rights to continue to run their tramway between the works and the canal.

Mr. HUTCHINSON contested two other matters—the standard price and the question of having a testing-place away from the works.

Mr. VESEY KNOX called evidence in support of the proposal to make the standard 4s. 6d. per 1000 cubic feet.

Mr. *A. F. Phillips*, the Company's Consulting Engineer since 1907, said they served a large area having a scattered population, with an average of only 66 consumers per mile of main, against an average of 200 throughout the kingdom. By adopting a sliding-scale as proposed, the Company would forego the right to pay to the shareholders back-dividends amounting to £22,133. If the maximum price allowed had been charged for gas supplied in the past, the receipts would have been increased by £20,929.

In cross-examination, witness said if they remained a "maximum price" Company, 10 per cent. was the largest dividend they could pay; whereas with a sliding-scale the dividend might be higher.

Mr. HUTCHINSON: Why should Chertsey, with practically the same sales, have a standard price of 4s. and be actually charging only 3s. 4d.?

Witness: They are in a better position with regard to capital.

Why should your present and future consumers suffer because of your past extravagant capital expenditure?—Whatever was spent originally has been more than made up since in expenditure out of revenue.

Witness was also questioned with regard to the Farnham, Godalming, and Leatherhead Companies, all of which were quoted as comparing favourably with Woking. He said he did not think 4s. would be sufficient as the standard price for his own Company.

In re-examination, witness said if they could not get a standard price of 4s. 6d., they had better remain a "maximum price" Company.

Mr. *E. L. Burton* and Mr. *E. H. Stevenson* having given evidence, and been cross-examined upon it,

The CHAIRMAN announced that the Committee considered 4s. 6d a fair figure, and the clause would therefore be approved.

Mr. HUTCHINSON then asked for a testing-station away from the works—stating that the Urban District Council would be willing to provide accommodation for this at their offices.

Dr. *Samuel Rideal*, the Gas Examiner to the Council, said it was impossible to get a fair test at the works, as there was a loss of illuminating power in conveying gas to a distance. Seeing that the Company proposed under their Bill to reduce the illuminating power from 15 to 14 candles, it was more than ever necessary to have an outside testing-station.

Mr. PADDON argued that the Company were being asked for something which was not required by the general law.

The Committee allowed the clause to stand as worded, providing for a testing-station at the works.

The last clause matter was a proposal by the Surrey County Council for a minimum depth of 3 feet for all new mains. This case and evidence were identical with that in connection with the Wandsworth Bill. The case for the promoters, however, was that whereas in the Wandsworth Bill a minimum depth of 2 feet was proposed, in the present case no minimum was inserted in the Bill; each instance being dealt with on its merits by the respective engineers. The same witnesses gave evidence as in the Wandsworth Bill.

Thursday, May 9.

The case in support of the Surrey County Council's request for a 3-feet minimum depth for mains, and seven days' notice of intention to break-up streets, instead of three days as provided by the Gas-Works' Clauses Act, was quickly dispatched this morning. For the Company, the point was reiterated that, unlike the Wandsworth Bill, no minimum depth was inserted in this Bill; and therefore it was open to the authorities concerned to exercise the fullest control.

The CHAIRMAN said the Committee could not accept the proposed amendment, feeling that the general law offered sufficient protection to the County Council and the Woking Urban District Council.

ELECTRICITY SUPPLY IN BOGNOR.

HOUSE OF COMMONS COMMITTEE.—Tuesday, May 7.

(*Before Sir* HENRY KIMBER, *Chairman, Mr.* LEACH, *Mr.* LEWIS HASLAM, *and Mr.* O'KELLY.)

The House of Commons Committee commenced consideration today of the Bognor Gaslight and Coke (Electricity) Bill and the Electric Lighting Provisional Order (Confirmation) Bill No. 1. These are two competing proposals asking for powers to supply electricity in Bognor.

Mr. BALFOUR BROWNE, K.C., and Mr. TYLDESLEY JONES appeared for the Bognor Gas Company; and Mr. VESEY KNOX, K.C., represented the promoters of an Electric Lighting Order for Bognor included in the Confirmation Bill.

Mr. BALFOUR BROWNE said that the first proposal was by the Bognor Gaslight and Coke Company, who asked for powers to supply electricity within their existing statutory gas limits. The second proposal was one put forward by a local gentleman (Mr. Tate), who sought powers to supply electricity within the town of Bognor only. Mr. Tate was a speculative builder. He had erected an arcade and a kursaal, with a theatre; and he had at present a small electric lighting plant from which he supplied these buildings. Under his proposal, he was, if he secured the powers, to hand them over, within twelve months, to a company, whose undertaking could ultimately be compulsorily purchased by the Local Authority, at the end of fifteen years, upon "going concern" terms. The Gas Company's proposal was also to supply electricity in Bognor and the surrounding districts. They claimed that, for such a small town—the population being only 8000—the combination of the electricity undertaking with the existing gas undertaking would result in far greater economies than if the electricity undertaking were in the hands of different people. The Gas Company, however, would keep separate accounts; and although the profits of the two undertakings would be pooled, the losses would not. It was proposed to raise £30,000 new capital; and for a gas company paying large dividends this should not be a difficult matter. At any rate, it would be far easier than the raising of the necessary capital by a new company. The Bognor Council were not opposing either proposal. When Mr. Tate applied to the Board of Trade for his Order—which the Committee were now asked to confirm—a local inquiry was held; and the Inspector, in recommending the Board to grant the Order, said he was unable to go into the merits whether the Gas Company or Mr. Tate should have the powers, contending that it must be fought out before a Committee of Parliament. He claimed that, in the hands of the Gas Company, Bognor would receive a supply of electricity far sooner than if the matter were left in the hands of Mr. Tate, because if he could not promote a company within twelve months the whole thing fell to the ground. As ratepayers, too, the Gas Company had objections to the form of the Order which the Board of Trade had granted to Mr. Tate. He had already mentioned the terms of purchase at the end of fifteen years; and he claimed that these should be "tramway" terms—*i.e.*, without any consideration for goodwill or compulsory purchase. Further, in all Orders granted to local authorities, the "Northumberland" clause was inserted. This had the effect of preventing a loss upon the undertaking from falling upon the rates. In this case, however, the clause was not in the Order; and the Local Authority could acquire the undertaking in fifteen years without being under the restriction that Parliament usually inserted. All the circumstances, he maintained, were in favour of the Gas Company, who were removing their gas-works outside the town—thus leaving a site available for the electricity works. Finally, he reminded the Committee that Mr. Tate was not allowed by his Order to work the undertaking, but must hand it over to a Company. As representing the Company, he was willing to make an offer there and then to buy up Mr. Tate's existing small plant and goodwill (if any) under the terms of the Lands Clauses Act, and was willing to have a clause inserted that a supply must be given in Bognor within two years.

The CHAIRMAN said that, *prima facie*, the Committee were struck with this offer. Would the other side consider it?

Mr. VESEY KNOX said he was not there in the position of defendant. He was promoting his own Order, which he wished to secure, and did not desire to accept the offer made by Mr. Balfour Browne. If, however, the Gas Company got the Bill, they should be compelled to buy out Mr. Tate, who held the opinion that he could serve the public better than the Gas Company.

The CHAIRMAN reminded Mr. Knox that he might possibly be worse off, if he fought the case on this issue, than if he were to accept an offer now. If the Committee came to a decision against him, on the ground that the public interest would be better served by the Gas Company, then he imagined the offer would not be open to him.

Mr. VESEY KNOX said he was bound to take this risk.

The CHAIRMAN said the Committee could only consider the matter from the public interest, and not in the interests of greater profit to Mr. Tate He could not promise that, in any event, the Committee would insert in the Bill terms as good as those now offered, as, if the Gas Company succeeded, Mr. Tate would not be injured, and would

retain the non-statutory business he now had. It was therefore necessary to go into the whole case.

Evidence was then called on behalf of the view that the electricity supply should be in the hands of the Gas Company under the conditions prevailing at Bognor.

Wednesday, May 8.

The suggestion thrown out by the Chairman yesterday, that the parties should endeavour to come to terms, found expression in a long conference this morning, with this end in view. Eventually it was announced that the following agreement had been arrived at: (1) The Company to lay mains and provide a supply in the compulsory area in two years. (2) The Company not to raise the price above 6d. per unit to consumers at present supplied by Mr. Tate, and to supply Mr. Tate with electricity for use during daylight hours at 1½d. per unit, with a minimum yearly payment of £100, for the theatre, arcade, and kursaal. (3) The Company to serve notice to treat within six months of the passing of the Bill, and to purchase, under the Lands Clauses Act, Mr. Tate's electrical undertaking, including his premises in Richmond Road and machinery, mains, and services. The Company to pay £250 towards the cost of promoting Mr. Tate's Order, the application for which will be withdrawn.

The Committee thereupon adjourned consideration of the Bill to enable a clause to be drafted embodying these terms.

LEGAL INTELLIGENCE.

ALLEGED POLLUTION OF WATER BY GAS LIQUOR.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Swinfen Eady, application was made on behalf of the Colne Valley Water Company for an injunction to restrain the Watford Gas Company from polluting their water-works by allowing gas liquor to escape.

Mr. UPJOHN, K.C., appeared in support of the application; Mr. RUSSELL, K.C., represented the defendants.

Mr. RUSSELL said the defendants had upon their premises a tank containing gas liquor; and it had developed a crack which allowed the liquor to escape. They were, however, now emptying the tank, and the process would be concluded very shortly.

Mr. UPJOHN: My friend says "very shortly." I had hoped for something more definite than that.

His LORDSHIP asked when the process of emptying the tank began.

Mr. RUSSELL said it was some days since. If they had put the contents into the river, the process would have taken a much shorter time; but they could not do this. He was informed by his clients that they had emptied the tank to a point below the crack; but they would, of course, continue to empty it to investigate its condition.

Mr UPJOHN said this was hardly sufficient, as his clients wished to know how many cracks there were in the tank. He suggested that Mr. Brough Taylor should be allowed to inspect the tank.

Mr. RUSSELL objected to this—remarking that the plaintiffs should not be too anxious to find many cracks in the tank, as the defendants' case was that the defective state of the tank had been caused by the plaintiffs. He added, in answer to a question by his Lordship, that the capacity of the tank was about 400,000 gallons, and at present it was rather more than half full.

After some discussion,

Mr. RUSSELL intimated that his clients were prepared to give way on the question of Mr. Taylor visiting their works; and he said they would proceed with all speed to empty the tank.

In view of this statement, the motion stood over for a week.

CUTTING OFF A GAS SUPPLY.

At last Tuesday's sitting of the Colne County Court, his Honour Judge Graham, K.C., delivered his reserved judgment in the case of *Berry v. Colne Corporation* heard on the 12th of March, and reported in the "JOURNAL" for March 19 (p. 814).

The plaintiff, Walter Ernest Berry, a grocer and pawnbroker, occupies two shops in Colne, and owns a furnished dwelling adjoining; the gas for the latter being supplied through a prepayment meter. In November last year, a gas inspector in the employ of the Corporation informed plaintiff that the meter had been broken open, and 8s. 7d. taken out. The Corporation repaired the meter, and charged the plaintiff with the cost; they also demanded payment of the 8s. 7d. Upon his refusal to pay, they cut off his gas supply, not only at the house but also at his business premises. As a consequence, he said his business had suffered, and so had his reputation as a citizen. He claimed damages to the amount of £15 15s.; but at the trial his Counsel said the action had been brought not so much to recover damages as to vindicate Mr. Berry's character in the eyes of his fellows.

His Honour now said he found that as plaintiff had already paid for his gas before the meter was broken open, the Corporation had acted illegally. At the most, under their agreement, they had only power to cut off the supply of gas with respect to the house. Plaintiff was therefore entitled to judgment; and, under the circumstances, he fixed the damages at £4, with costs. As to the counter-claim of the Corporation, there would be judgment for 1s. 6d., without costs.

At this stage, the Town Clerk (Mr. A. Varley) interposed, and argued that a County Court Judge had no jurisdiction to try such a case as the present. The only procedure open to the plaintiff was by way of summons before the Magistrates for a penalty.

His Honour said the point raised by the Town Clerk was important; and judgment would be reserved until next Court day.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Proprietors was held last Tuesday, at Salisbury House, London Wall, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting.

The CHAIRMAN, in affixing the seal to the Register of Proprietors, remarked that it might interest some of those present to know that the number of the proprietors was now 6897.

The Auditors' report was next read by the Secretary.

PROFITS AND APPROPRIATION.

The CHAIRMAN then said: Ladies and gentlemen, It is now my duty to move—"That the report and accounts for the half year ended the 31st of December last, which have been circulated, be taken as read, and that the report on the affairs of the Association, together with the scheme for the appropriation of the profits, be received, adopted, and entered on the minutes." In doing so, I will refer to a few of the items contained in the report, as well as in the balance-sheet. First of all, I may as well allude to the profit made during the half year. This, as clearly stated, amounts to £275,454—being a very small increase (only £3424) on the corresponding period of 1910. We, however, brought forward £45,745, so that the total available for distribution is £321,199. The scheme the Directors propose to you is that this sum be divided as follows: A dividend at the rate of 4½ per cent., less income-tax, which will absorb £222,300, and an appropriation to the pension reserve fund of £40,000; leaving a sum of £58,900 to be carried forward to the next half-year's accounts. There are two items to which I wish to refer in few words—the slight increase in the profits compared with the corresponding half of 1910; and the large amount which is being carried forward. Every one of you is aware from what we experienced in England of the effects last summer and autumn of the great heat, drought, and light, which some of us enjoyed, and some did not. The same kind of weather was experienced in Germany—in fact, it was to a greater extent enjoyed in Germany than in England, because the warm weather continued right up to Christmas time, and the cold weather only came after Christmas. I had an experience of this because I was in Hanover for a fortnight before Christmas; and it was really so hot there that fires and heating apparatus became unnecessary. Then there was another fact which interfered with the profit—that was, the depression (if I may so call it) in the selling values of coke. We had very good sales of coke; but unfortunately the prices were very much lower than usual. The result was that, though we bought our coal cheaper, the lower value of coke entirely did away with any benefit that might have been derived from the easier prices of coal. I have spoken on previous occasions of the balance carried forward. You know that at the end of last year we finished working at Vienna. That was a very profitable station which we shall not have to draw upon any longer. Therefore, the Directors think it is only right on this occasion that we should carry forward so large a balance as £58,900.

SALE OF GAS.

The gas sold in consequence of the fine weather of which I have spoken exhibited an increase of only 2·87 per cent.—not quite 3 per cent. I think this is the lowest increase of gas sold that I have ever had to report to you since I have occupied the chair. The last lowest rate of increase was in 1910, when it was 4½ per cent. However, as a proof that the popularity of gas is by no means on the wane, we connected a very large number of consumers during the half year; and it was simply the effect of the exceedingly fine, warm weather which prevented any large general increase in the consumption.

EXTENSION OF THE HANOVER CONTRACT.

There are one or two points in the balance-sheet to which I should like to refer. If you will look at the item of sundry creditors, and if you happen to have with you the accounts for the corresponding half year, you will find that it has increased by something like £460,000. The reason for this is that almost at the close of last half year, we were able to make a fresh contract with the town of Hanover, and to extend our concession there till 1950. Of course, when one prolongs contracts with foreign towns nowadays, they expect something very handsome in the way of premium, especially in a large town like Hanover (which is a steadily increasing town), and we had to pay for the extension of the contract the sum of £500,000, to be paid in three instalments; £200,000 on April 1 this year; £150,000 on April 1, 1913; and £150,000 on April 1, 1914. It will probably interest the proprietors to know that we were in a position to pay the first instalment in the early part of January, under discount, from the money received from the sale of plant at Vienna, and the money still to be received for the Association's assets in that city will, in all probability, cover the remaining instalments. In fact, this really represents a transfer of capital from one station to another. The Association have now, as I said, a life of 38 years in this ever-increasing and very large town; and we shall amortize this amount during the period of our concession. I only hope that those who follow after me will be able to make a further extension of the contract at Hanover in the days to come. Then there is another item—stocks at the stations. This is rather more than £90,000 less than in the past half year. The reason is that the general stores at Vienna have come to an end, and have been sold; and there has been a considerable reduction in the amount of the residuals. There was an opportunity of selling a large quantity of our stock of coke, which has thus been considerably reduced, though the price was not very good.

HAPPY POSITION PRIOR TO THE COAL STRIKE.

On the occasion of the last meeting, I referred at some length to the trouble the Directors experienced during the year with regard to the coal supply—not only owing to the railway strike which took place in

England, but also owing to the lowness of the water in the canals and rivers throughout Germany, due to the great drought. Then there followed the coal strike in Belgium, from the mines of which country we obtain considerable supplies. Anticipating trouble, the Directors urged upon their coal contractors in England to push forward their deliveries with the greatest possible speed, so that we managed to get the whole of our deliveries completed by the end of December. I certainly should like to put it upon record that this appeal was not made in vain, because, in the face of many difficulties—among them an unforeseen heavy rise in freights which the contractors had to bear—the Association's contractors, in almost every instance, delivered their full contract quantity, with the result that the Directors could have viewed a continuance of the strike which took place later on with perfect equanimity for a month or even six weeks longer. I think this is a very striking record of the friendly feelings which have existed between ourselves and our contractors with whom we have dealt for many years in the matter of the important supply of coal, and I am glad to be able to put this on record. It is very satisfactory so far as it goes. But, of course, we have still a good deal of anxiety in regard to our future coal supplies. You all know—everybody knows—we have been suffering from a very severe strike in England; and the consequence is that the time for shipment to Berlin this season has been considerably curtailed. It is only for a certain number of months of the year that we are able to ship supplies to Berlin, because of the freezing-up of the Baltic and the water-ways by which we convey our coal there. The result is that we have been seriously urging our contractors to deliver the coal we shall require next winter in Berlin.

COLDER WEATHER.

Since the turn of the year, I am glad to say, there has been much colder weather in Germany—in fact, when I was on the Continent only a month ago, a severe snowstorm and ice were experienced—just like midwinter. The result has been that our coke stocks have further diminished; and in March we had only 11,670 tons, compared with 35,600 tons in March, 1911.

GASHOLDER DISPUTE.

I mentioned at the last meeting that we had a rather unfortunate gasholder at Berlin—a gasholder about which there had been considerable dispute with the authorities; and this dispute, I am sorry to say, has not yet been settled. The Association have lodged an appeal against the injunction obtained by the Town of Schöneberg against its use; and this matter has been referred to an independent and unbiassed arbitrator. I hope that in a very short time we shall get a decision, which, I trust, will be in our favour.

CLEARING-UP AT VIENNA.

Then in regard to the Vienna liquidation, the Association's assets are being realized, and the work is proceeding very regularly. There is little to add to the statement I made to you six months ago with regard to this matter. We have since been able to sell the land at Floridsdorf; and the only assets remaining to be realized are the sites of two of the disused works, and the freehold house which was formerly the dwelling of the Chief Engineer.

HEAVY LIABILITY FOR PENSION AND OTHER FUNDS.

I also spoke to you at our last meeting with regard to the pensions which we have to pay in connection with Vienna; and I cannot help alluding to it again, because I think it is a matter that cannot be rubbed in to the shareholders too often, because of the very large amount which it represents, and the liability for which we have to meet. The pensions at Vienna, dating from 1900, were £9276; and the new pensions from January this year are £10,780—making a total charge of £20,056, in addition to which the Directors granted gratuities to the members of the staff and the workmen who were not eligible for pensions, amounting to £12,180. Now the total of the pensions which we have to pay is as follows: Pensions to technical and clerical staff and widows, £19,900; and pensions to workmen and widows, £17,600—a total of £37,500. In addition to all this, we have to pay to sick funds, Government old age, invalid pensions, and accident insurance, which all are imposed as a sort of Government duty; and they amount to upwards of £15,000. So our total liability under the head of pensions is £53,000. I make these remarks because one or two proprietors have been writing to me to know when the pension fund is going to be stopped. When we have a total liability of £53,000 a year, you can readily estimate the amount which it will require to put a pension reserve fund into a proper situation. At the present moment we have only £415,000 in the fund, so that the £40,000 we propose to transfer to it to-day will make it £455,000. In my opinion, it should be certainly nearer a million before we ought to stop.

TECHNICAL STAFF CHANGES.

There are one or two matters of private interest in connection with the changes of the *personnel* of the staff at Brussels, to which I wish to allude. A year ago I spoke about the jubilee of Mr. Salomons; and he has now retired on his pension from the 1st of May this year. We have appointed in his place Mr. De le Paulle, who has been his chief assistant at Brussels for seventeen years, and who has served the Association exceedingly well, and given proof of his fitness for the post. He has charge of Brussels and the suburbs, and all the business transacted in the neighbourhood. We have also had to accept the retirement of our Chief Engineer at Antwerp. I am sorry to say that Mr. Brender à Brandis has for some time past been in bad health; and we felt that, he having served us faithfully for a number of years, it was time for him to retire, and to have a rest. He has been succeeded by Mr. A. F. P. Hayman, who entered the service in 1881, and has served the Association at Lille, Haarlem, Brussels, Berlin, and Antwerp. He will be assisted at Antwerp, on the political side of the business, by Mr. Maurice van den Abeele—an influential citizen who has already given proof of his energy and ability. Another retirement is that of Mr. Egeler at Vienna, in consequence of our having given up working in that city. Mr. Egeler retires on a pension. He has been with us 41 years; his father for a great many years was our trusted Engineer at Amsterdam. He has served us at Ghent, Rotterdam, Amsterdam, and Vienna, where he was for twelve years the Chief Engineer.

A GENERAL SURVEY.

Gentlemen, these remarks deal with the principal affairs of the Association during the half year. You will understand in dealing with such a vast concern, it is impossible to go particularly into the affairs of each station; and therefore, when I am before you, I try to pick out those items which will, in my opinion, be of interest to the proprietors, and which will deal generally with the whole situation.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion.

Sir JOHN RUNTZ remarked that the Chairman had made such a clear statement on the affairs of the Company during the half year, that, as usual, he had left very little to complain about. He (Sir John) thought that any body of Directors who could show a profit of between £500,000 and £600,000 a year ought to be congratulated. The proprietors did congratulate the Board that day. He was glad the Chairman had referred to the pensions fund. One had watched this fund grow year by year; and during the past half year, £40,000 had been added to it. In the previous half year, £40,000 was also transferred to it; so that out of the profit of £507,000, the Directors had put by £80,000 for the pension fund. Now this was practically a little more than 1½ per cent. on the capital stock. This was a large item indeed. The Chairman referred to the fact that the pension fund was £53,000 per annum, which was roughly a 10 per cent. tax on the annual profits; and this was a very serious item indeed. He presumed from the remarks made that day that the Association were obliged to pay these heavy taxes, and that, although they had closed the Vienna station, they were in duty bound to pay them. He asked whether there were any means by which they could liquidate some of these pensions, by paying a lump sum down, and so getting rid of the liability in the case of certain individuals. The item to which the Chairman had referred was a serious one; and if some scheme of this sort could be worked out, he was sure it would receive the support of the proprietors. He saw the Board had written-off from Consols another £20,000. Some time ago he suggested that the Board should put the reserve fund into something else; but that was an old story. He did not know how far the Directors were going to write-off below 80. He suggested they should stop there. They had written-down quite enough; seeing that the stock now stood at 78½.

Mr. SAMUEL SPENCER suggested that in the accounts they should have marginal figures showing for convenience the items for the corresponding period of the previous year.

The CHAIRMAN, in reply, said that unfortunately Sir John Runtz was not at their meeting six months ago. He (the Chairman) then intimated that, when the Directors had written-down Consols to 80, that was the point at which they would stop. With regard to the pensions, they were obliged to pay them. The pensions scheme was drawn out with very great consideration by the Board some years ago. It was posted up in every one of their works all over the Continent; and the Association were pledged to pay them. Possibly there might be a few people who would compound them, and take a lump sum. But the Board, as a rule, did not care much about that, because they found, if a man compounded for his pension, in a few years' time he lost the money, and then he came back, *ad misericordiam*, to the Board for a little more. Then it was a very difficult thing to deal with such a case, especially when a man happened to have been thirty, forty, or more years in the service. Therefore, the Board thought it better to adhere to the pensions system as much as possible. He had no doubt they would be able to carry out Mr. Spencer's suggestion. He (the Chairman) had really thought of it himself on more than one occasion.

Proposed by the CHAIRMAN, seconded by Sir CHARLES J. JESSEL, Bart., a dividend of 4½ per cent. was declared, less income-tax, on the £4,940,000 stock of the Association.

Proposed by the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, Mr. L. R. Wilkinson was re-elected a Director.

On the motion of the CHAIRMAN, seconded by Sir C. JESSEL, the Hon. Sir E. Chandos Leigh, K.C., K.C.B., was also re-elected.

The DEPUTY-CHAIRMAN moved the re-election of Mr. J. Horsley Palmer as a Director. He observed that there was an interesting fact regarding Mr. Palmer's connection with the Association which, he thought, was almost unique—certainly unique in the history of any gas company of which he (Mr. Lucas) knew. Mr. Palmer was the third of his generation who had occupied a seat on the Board. His grandfather was, as he understood, the Chairman, his father was a Director, and now Mr. Palmer had been a Director for 37 years, of which period he had now been Chairman some years. These were interesting facts; and there was no getting over the impression he felt that Mr. Palmer was saturated with the traditions of the Association; and those traditions were exceedingly good, as the proprietors knew from the continued prosperity they had enjoyed for so many years. The history of the past guaranteed the future, so that the proprietors were perfectly safe in re-electing Mr. Palmer to the post which he had so ably occupied for many years.

Sir E. CHANDOS LEIGH seconded the motion, which was carried.

The CHAIRMAN, in acknowledgment, thanked Mr. Lucas for his generously kind words. It was, of course, a matter of heredity with him (the Chairman) that he should devote his attention to the affairs of the Company. It had been a great pleasure to him to work for the proprietors for so many years; and he trusted he should be spared to work for them a little longer.

Moved by Mr. BERNARD F. HARRIS, and seconded by Mr. DENDY MARSHALL, the retiring Auditor (Mr. T. Bromhead Bassett) was re-appointed.

Sir CHARLES JESSEL remarked that he was sorry the Governor of the Gaslight and Coke Company, their esteemed colleague (Mr. Corbet Woodall) was absent abroad, as he (Sir Charles) was sure the vote he had to propose would have come with better grace or more effect from him. He moved a vote of thanks to the staff at home and abroad for the excellent work they had done during the half year. He did not wish to detain the proprietors by going through the merits of any individual member either abroad or at home, except in one instance. He should like to call attention to the excellent work that had been

done during the half year by their Secretary. He did so with the greater emphasis, because it was an open secret that it was not the work of the Board that brought about the happy position which they were in with reference to coal during the strike of the British colliers, but it was through the foresight of Mr. Wilson that they were in the happy position alluded to by the Chairman. Although the motion he had to put to the proprietors always received their approbation, he (Sir Charles) was sure it would be, through the fact he had mentioned, all the more cordially received on this occasion.

Sir JOHN RUNTZ seconded the motion, which was cordially passed.

Mr. WILSON briefly but sincerely replied on behalf of himself and his colleagues at home and abroad.

The customary acknowledgment of the services of the Chairman and Board concluded the proceedings.

FATALITY AT THE STRATFORD-ON-AVON GAS-WORKS.

Explosion in the Meter-House.

Shortly after eight o'clock last Wednesday night, an explosion occurred in the station meter-house at the Stratford-on-Avon Gas-Works, which unfortunately caused the death of two men—Arthur Timms, aged 44, and George Collins, aged 22—who were at work in the house at the time. The building was completely wrecked. The Gas Engineer and Manager (Mr. J. S. Cranmer) was quickly upon the spot, and a rescue party immediately set to work to extricate the men from the *débris*. Timms was found near the meter, partly covered by the remains of the building. He was suffering from severe injuries, and was removed to the hospital, where he died next morning. When Collins was reached, his body showed that death must have been instantaneous. His remains were removed to the mortuary. At the time of the accident, the works were practically deserted—only four stokers (including the two killed) being on the premises; and though they felt the force of the explosion, they fortunately escaped injury. In addition to the destruction of the meter-house, a corrugated iron shed was wrecked, and a large gasholder, some 50 yards away, and containing about 250,000 cubic feet of gas, was so seriously damaged that the gas escaped—the town necessarily suffering great inconvenience from the loss of gas. Various buildings in the works also were more or less injured by the explosion, the cause of which is at present a mystery. It is reported, however, that one of the uninjured men had heard rumours earlier in the day that there had been an escape of gas in the meter-house. The extent of the damage is estimated at not less than £1000. The Gas Committee of the Corporation held a meeting on Thursday to inquire into the cause of the explosion; and they decided to call in an expert to investigate the matter. Meanwhile they made a liberal grant of money to meet the immediate necessities of the widows and families of the deceased.

Opening of the Inquest.

At the Stratford Town Hall on Friday, an inquiry into the circumstances attending the deaths of the two men was opened by Mr. G. F. LODDER. Among those present were Mr. J. H. Rogers, one of the Inspectors of Factories, the Mayor (Mr. F. Ballance), the Chairman of the Gas Committee (Mr. Everard), the Town Clerk (Mr. R. Lunn), and Mr. Cranmer.

The CORONER (addressing the Jury) said they must do their utmost to find out what was the cause of the explosion; and this might not be easy, because the only two men who really knew what took place were killed. He did not think they would be able to complete the inquiry that day, owing to the necessity of having some expert evidence.

Mrs. *Collins* stated that for some two or three weeks her husband had complained of pipes being stopped up, and had said he should not be surprised if they were blown up. She did not know what pipes he referred to; but he said he dreaded going near the place, and he was not the only one.

Mrs. *Timms* said her husband also had complained of stopped pipes and of the retorts being hotter than formerly. When dying he said he wished he had not gone to the works; but he did not say anything as to the cause of the accident.

Mr. *J. S. Cranmer* said he was quite at a loss to explain the cause of the explosion. It was usual for the meter and governor to be in the same building. He described the ventilation and fittings of the meter-house, and said Collins would not be engaged in repairs of any kind there. Timms's duty was to attend to the valves, and regulate the flow of gas between the holders; also to regulate the pressure. He was a very steady man, and quite sober. The meter-house was lighted from outside by two suspended lamps; but he could not say whether or not they were alight on the evening of the explosion. In his opinion, the explosion took place in the basement of the house.

The CORONER: Would you like to say anything with respect to what has fallen from Mrs. Collins?

Witness: Yes. Her husband was alluding to the stopping of the ascension-pipes in the retort-house, which had nothing whatever to do with the wrecked building, which was quite 50 yards away. They had had a good deal of trouble through trying to get more gas out of the coal; and the result was the stoppage of the pipes. The men had the additional work of freeing them, and naturally did not like it.

Medical evidence having been given as to the injuries sustained by the deceased,

Harry Thomas, a stoker of 36 years' experience, said that about 8.10 p.m. on the night of the accident Timms went to him and stated that there was an escape of gas at the meter-house; and he (witness) replied that the foreman had been gone a quarter-of-an-hour. Timms did not say the escape was anything serious.

The *Town Clerk* said he saw Timms just before his death, and asked him why he went to the meter-house. He replied that the water was blowing off at the back of the meter, and Collins and he went in. They had not been there "half a jiff" when the explosion happened. Timms also said that no naked light was used, and he did not see Collins strike a match. They went in in total darkness, and saw no flames.

At this stage, the inquiry was adjourned till the 22nd inst., when the evidence of the expert called in by the Corporation will be taken.

EARL GREY ON CO-PARTNERSHIP.

The Annual Meeting of the Labour Co-Partnership Association was held at the Mansion House last Thursday, and was attended by a large number of the pioneers and supporters of the system with which the Association is identified. The principal speaker was Earl Grey, the ex-Governor of Canada, who, it may be remembered, unveiled the statue of Sir George Livesey at the South Metropolitan Gas-Works early in December last.

In the course of his remarks, his Lordship said the recent strikes had convinced people that it was necessary for the nation to set its industrial house in order, because repetition of these experiences on a frequent and extensive scale would quickly reduce the country to insecurity, poverty, and despair. In his belief, the remedy lay in co-partnership; but he had not been converted to this view by labour troubles, but had held it and urged it for a quarter-of-a-century. The Labour Co-Partnership Association aimed at securing industrial peace, promoting industrial efficiency, raising wages to the highest point which each industry could afford, and finally ennobling and dignifying the status of the manual worker. Industrial efficiency depended upon industrial peace, and the national well-being upon both. National prosperity could only be secured if those engaged in the vital industries on which the food, warmth, and life of the nation depended recognized the duty they all owed to the community at large. The problem before them was to organize industry on lines of fairness; and he was satisfied that fairness was the keynote of the British character. Labour and capital to-day were organized in opposing camps; and the object of the Association was to promote the common interest of the two. The capitalist was inclined to give the minimum necessary to secure the labour he required; while labour in return was too apt to consider that all required of it was the minimum of work which would avoid dismissal.

Earl Grey proceeded to argue that the interests of capital and labour were not sharply divided; and he quoted a number of instances up and down the country in which attempts at fusion of these interests had been attended by the happiest results. Prominent among his examples was that of the South Metropolitan Gas Company; and he estimated that in the gas enterprise alone there was now close upon £50,000,000 of capital administered upon the late Sir George Livesey's profit-sharing principle. The system under which all surplus profits went to capital could not possibly satisfy the requirements of a civilized and well-organized society. What was wanted was a system which would safeguard the consumer, and also provide the worker with a natural and self-compelling inducement to help the industry in which he had invested his labour. This system was provided by co-partnership, which insisted that the worker had a right to participate in the net profits that might remain after capital had received its fixed reward. Just as the reward of labour was now sometimes fixed by Trade Union rates, so the reward of capital was fixed by the amount which it was necessary for each industry to give. When each of these claims had been satisfied, the surplus of profits should be distributed between labour and capital on some principle of equity which it would be easy to establish. He had been asked by a large employer in the North: "Why should I let my workers share my profits while they are unwilling to share my losses also? A splendid answer to such an argument was supplied by Sir George Livesey, who asked the questioner what would be the difference in profit if the work were done by contented as compared with discontented labour. The employer was willing to admit that at least 25 per cent. better work could be got out of contented labour; and his admission largely supplied the answer to his own query. His Lordship said he was convinced that labour in its appointed hour would emerge from the hireling chrysalis in which it was at present enveloped into the higher and nobler status of co-partnership with capital. It was by justice alone that this could be accomplished; and in justice he included the affection which one man owed to another, and which could be reached more quickly by education and by co-partnership than by any interference on the part of the State.

Cardiff Water-Works Extensions.—The Finance Committee of the Cardiff Corporation have lately sanctioned the borrowing of £25,668, to cover the following proposed expenditure by the Water Committee: Land for the Llwyn-On reservoir, £4807; ditto for the extension of the Heath service reservoirs and filter-beds, £15,400; high-level main and automatic sprinkler installations, £1760; Trade Street depôt extensions, &c., £869; new pumping plant at Cogan station, £2800.

Gas Profits and Rate Relief at Heywood.—Mr. D. Healey, the Chairman of the Gas Committee of the Heywood Corporation, presented at the Council meeting last Thursday the annual statement as to the working of his department. The consumption of gas for the past financial year was 133,062,000 cubic feet—a decrease of 751,000 cubic feet, compared with 1910-11, due entirely to labour troubles. There was a net profit of £1580; and the Committee at first offered £508 in relief of rates. As the result of a further meeting, however, the Committee decided to increase the grant to £800.

Water-Works Profits at Reading.—The Reading Borough Council at their last meeting availed themselves of the whole of the net profits of the water undertaking to the 31st of March—viz., £3100, which, placed to the credit of the district fund account, is equal to a reduction of nearly 2d. in the pound upon the district rate. This net profit is only £36 less than for the previous year, and is exceedingly satisfactory, bearing in mind the great drought of the summer of 1911, during which much additional pumping was necessary, involving the consumption of an increased quantity of coal. Yet Reading enjoyed the whole year through a full and unrestricted supply of water, which was not the case in many towns during the very trying period of the drought.

GLOVER-WEST VERTICAL RETORTS FOR BRIDGWATER.

The Directors of the Bridgwater Gas Company some short time since had under consideration the advisability of improving their manufacturing plant; and they accordingly instructed their Engineer and Manager (Mr. J. Hughes Cornish) to inspect gas-works in various parts of the country, and report on the newer systems of carbonization now in use. The result was the presentation of an interesting and exhaustive account of his tour; and after carefully considering it, the Directors decided to put up a new retort-house, and equip it with 20 vertical retorts on the Glover-West system, capable of producing 500,000 cubic feet of gas per day—West's Gas Improvement Company, Limited, being entrusted with the work, and the furnishing of the coal-handling plant connected with it. The house will be constructed of steel, lined with brick filling; and the coal-store will be of reinforced concrete throughout. The contract for the latter has not yet been placed; but the plans and specifications are ready, and tenders for the work will shortly be invited. In order to make room for the new buildings (the foundations for which are now being put in by Messrs. Ashton and Sons), one of the larger gasholders was taken down last year and re-erected on a different site by Messrs. W. C. Holmes and Co., of Huddersfield. It was a rather troublesome job, from the point of view of the foundations, as the completed structure weighs 1650 tons. Stable foundations were therefore of the utmost importance. These were carried out in reinforced concrete by Mr. C. Bryer, jun., of Bridgwater, in accordance with plans and specifications prepared by Mr. Cornish; and the work appears to have been quite successful, as no signs of sinking have appeared. The Directors look forward with confidence to more economical working with the new carbonizing plant, which will, it is stated, be the first of the kind to be erected in the South of England.

DUKINFIELD GAS DEPARTMENT.

The Past Year's Working.

The Gas Manager of the Dukinfield Corporation (Mr. William Lindley) has issued his report on the working of the gas undertaking in the twelve months ended the 31st of March last, together with the accounts. The gas-rental amounted to £10,311; a sum of £2186 was received for coke, £548 for tar, and £671 for ammoniacal liquor; and the total receipts were £13,751. The expenditure amounted to £9627 (£4904 being for coal, £1118 for wages, and £1009 for rents, rates, and taxes); leaving a balance of £4124. By the addition of cottage rents and bank interest, this was brought up to £4134, which was disposed of as follows: Twelve months' annuities, £1062; interest on loans, £986; and sinking fund, £1023—leaving a profit of £1063. There was a balance of £4812 on the profit and loss account on March 31, 1911; and the addition of the profit for 1911-12 made a total of £5875. A sum of £2401 was written off in respect of obsolete plant; and there was left a surplus of £3474. Mr. Lindley says the carbonizing plant worked satisfactorily during the year; the yield of gas per ton of coal being 11,981 cubic feet. The sale of gas amounted to 88,917,000 cubic feet, apportioned as follows: Cottages, by ordinary meters, 41,226,100 cubic feet; ditto slot meters, 13,402,700 cubic feet; mills, 26,536,600 cubic feet; public lamps, 6,568,000 cubic feet; and gas offices, works, &c., 1,183,600 cubic feet. The total make of gas being 96,845,000 cubic feet, there were unaccounted for 7,928,000 cubic feet, or 8·18 per cent. The quantity of coal and cannel carbonized was 8083 tons; and of the 11,981 cubic feet of gas per ton made, 11,000 cubic feet were sold.

At the monthly meeting of the Council on Monday last week, Mr. J. Cooke, in moving the adoption of the minutes of the Gas Committee, said no doubt each member had received a copy of the annual report, and he hoped they considered the result very satisfactory. The increase in the sale of gas was nearly 5½ million cubic feet. The carbonizing plant had done very well. The make of gas per ton of coal was 11,981 cubic feet, and they had sold 11,000 cubic feet—the best result they ever had. Last year they reduced the price of gas 2d. per 1000 cubic feet, which made the price 2s. 4d. to ordinary and 1s. 11d. to large consumers. This concession cost the Committee £750. There was no charge for meters, which was equal to 2d. per 1000 cubic feet. The works, mains, and services were in a very good state of repair, and the financial position was a very sound one. They had written off capital account £2401, and he might say this was the whole of the amount they had over-borrowed on the gas-works. They had taken this from the profit and loss account, and it now put them upon a sound financial footing. The prospects for the coming year were distinctly promising.

NELSON GAS UNDERTAKING.

The Price of Gas.

For the sixth year in succession, the Nelson Corporation have managed to get through with the product of a 7s. 6d. rate and the aid of the profits from the trading committees.

At a meeting of the Town Council last Wednesday night, Alderman Shaw, the Chairman of the Finance Committee, said, in the course of his budget speech, that the profits of the Gas Department, so far as they related to the relief of the rates, had now reached the high-water mark; and though there was provision in the estimates of the next year to place the sum of £2500 to reserve, there was a tendency on the part of gas consumers to expect a reduction in the price of gas. This was a question which, he said, would have to be met; but it should be remembered that a reduction of 3d. per 1000 cubic feet would, whenever it took place, mean an increase in the rate of the borough of at least 7d. in the pound. He found also that there was in the next year the sum of £2000 more to provide for interest and sinking fund than was estimated for last year. This was natural, in view of their contemplated borrowing for new works, which the Council were already pledged to, and meant an additional cost equal to a 3d. rate per annum. Members of the Council were also aware that recently the wages of nearly the whole of the workmen employed by the Corporation were advanced 5 per cent.; and this meant an increase in the wage bill by over £1400, or more than a 2d. rate. Therefore the Council should think carefully before committing themselves, either as to a reduction in the price of gas or to a definite statement with respect to a certain increase in the rates.

Mr. T. Boothman, one of the Labour group, said he was opposed to the policy of keeping the price of gas high so that the rates could be kept low. This was, in his opinion, an unwise and an unfair policy. If the Chairman of the Gas Committee looked into the matter as to how the different sections of the ratepayers were affected by a reduction in the price of gas and an increase in the rates, he would find that it paid the average ratepayer better to have cheaper gas and face an increase in the rates—proportionately, of course. The manufacture of cotton goods was the staple industry of the town, and paid indirectly about one-fifth of the total rates. It was a fact that the manufacturers only consumed one-tenth of the total gas sold, which meant that, when the gas profits were shared out through the rates, they took double the amount they were really entitled to. He contended that the proper way was to reduce the price of gas, even if the rates had to be increased. This would be better for the average working man, who ought to be considered. The Gas Committee, in order to give an additional £2500 to the rates, had dipped into the department's surplus to the extent of £2000.

In his reply upon the discussion which followed, Alderman Shaw reminded the Council that when a reduction in the price of gas was made, the outside authorities supplied by them would share the benefits; while Nelson would have to bear the cost. The outside districts took 25 per cent. of the total consumption.

The usual resolutions for a rate of 7s. 6d. in the pound were adopted, and the grants from the different trading committees confirmed.

PROGRESS AT HARPENDEN.

Gas for Cooking.

In the show-rooms and offices of the Harpenden District Gas Company there was inaugurated on the 1st inst., a series of instructive lectures on gas cooking—Mrs. Godfrey Sutcliffe, M.C.A., being the demonstrator. The Chairman of the Company (Mr. Henry Salisbury) opened the proceedings, in the presence of the Directors and a large and appreciative audience. After alluding to the advantages of gas for cooking, he stated that he remembered Harpenden without any system of street lighting, and only the old-world open range for culinary purposes. Mr. T. H. Martin, Assoc.M.Inst.C.E., who followed, called attention to the very moderate charge for gas in Harpenden, and the recent extensions and improvements to the Company's works, by which everything possible was being done in the interests of consumers to bring gas, both as a fuel and illuminant, up to the very highest point of efficiency. He remarked that the show-rooms were worth a visit, to see the use of gas for heating water for all domestic purposes. Mr. F. W. Taylor (the Engineer and Manager) had fitted up in one large window a complete bathroom, which attracted great attention. Mrs. Sutcliffe then proceeded to demonstrate by practical cookery the advantages claimed for gas. There was a series of eight lectures, during which she introduced every branch of cookery, from dinner to bread and the simplest breakfast dishes. Many orders were received by the Company—testifying to the success of the lectures, &c.

It is interesting to note that the business is fast growing, and that the Company are quite up to date. In 1900, the make of gas was 10,701,000 cubic feet, and in 1911 it was 35,178,000 feet; the increase in this period being 328·73 per cent. In the former year the price of gas was 4s. 6d. per 1000 cubic feet for domestic purposes and 4s. for power; whereas from the March quarter of this year the prices have been fixed at 3s. 6d. and 3s. respectively—representing a reduction of 1s. per 1000 cubic feet in eleven years. The dividend paid in 1900 was 4 per cent.; while the distribution for the year ending June 30, 1911, was 10½ and 7¾ per cent. This is a good record. The Company are progressing rapidly; and the works are efficient in every respect. A sulphate of ammonia plant and boiler-house are in course of erection, and will be completed before the end of June. The work is being carried out to the designs of Mr. Taylor.

Bury and District Joint Water Board.—The annual statement of the accounts of this undertaking shows that the income amounted to £63,292, and the expenditure to £76,275; leaving a deficiency of £12,983 to be made up by the constituent authorities. During the financial year, the capital outlay was increased by £18,745 to £1,513,396; and the indebtedness now stands at £1,270,937. Precepts have been made on the constituent authorities as follows: Bury, £5436; Radcliffe, £2209; Rawtenstall, £1343; Haslingden, £1257; Ramsbottom, £937; Whitefield, £715; Little Lever, £340; Tottington, £431; Bury (Rural), £311.

South Barracas Gas and Coke Company.—The Directors of this Company report for the past year that the amount brought forward from the last account is £10,967, and the balance on the revenue account is £5415; making together £16,382. The interim dividend of 2 per cent. paid in October last absorbed £4000; leaving an available balance of £12,382. From this the Directors recommend the payment of a final dividend for the six months ended Dec. 31, 1911, of 2 per cent., making 4 per cent. for the year, free of income-tax, absorbing £4000, and leaving to be carried forward £8382. The output of gas last year exceeded that of 1910 by 4 million cubic feet, and there was an increase of £1609 in the receipts for gas and residuals sold; but the net trading profits decreased by £2087. On the other hand, a profit of £4246 was realized from the sale of investments. Reference is made to the retirement of Mr. Darrah, the Manager, and to the appointment of Mr. R. B. Brown his successor (already notified in the "JOURNAL").

BURTON-UPON-TRENT GAS UNDERTAKING.

The Past Year's Working.

In the "JOURNAL" for the 16th ult. (p. 177), the Gas and Electricity Committee of the Burton-upon-Trent Corporation were congratulated upon their successful working in the twelve months ended the 31st of March. This is borne out by the report of the Committee which has lately been issued. The revenue account of the gas-works shows total receipts amounting to £63,190, and working expenses (including debt charges of £6268) totalling to £45,602; leaving a net surplus of £17,588, which is £3423 more than that for 1910-11. The surplus has been allocated as follows: In relief of rates, £7000; new prepayment meters and fittings, £528; new stoves and fittings, £2166; expenditure on the Barton extension above that provided for out of capital, £350; to the reserve fund, £7544.

Continuing their policy of giving every facility for the use of gas, the Committee followed up the abolition of meter-rents by doing away with gas-stove rents during the two winter quarters, as from September last; and they have abolished them almost entirely in the case of consumers who have had stoves on hire for five years or more. These concessions having been made with a view to stimulating the consumption of gas, it is gratifying to find from the figures in the report that there are increases in the gas sold for every purpose. The total quantity sold, as given below, is a record for the undertaking—exceeding the previous maximum of 1904 by 17 millions. Last August, Parliament sanctioned the extension of the boundaries of the area in which the Corporation can supply gas, to enable them to purchase the Barton-under-Needwood gas undertaking, and supply the parish, and incidentally that of Branston, direct from Burton. This extension has been completed.

The quantity of gas sold was 363,076,800 cubic feet, allocated as follows: Ordinary consumption for lighting, &c., 238,772,900 cubic feet; through prepayment meters, 70,265,900 cubic feet; public lighting, 24,998,000 cubic feet; motive power, 22,940,300 cubic feet; and manufacturing purposes, 6,099,700 cubic feet. There were used on the works 3,425,100 cubic feet, and 2,500,000 cubic feet were employed in connection with illuminations; making 369,001,900 cubic feet accounted for. The total make being 393,171,000 cubic feet, 24,169,100 cubic feet, or 6·15 per cent., were unaccounted for. The quantity of coal carbonized, under the supervision of the Assistant-Manager (Mr. R. S. Ramsden), was 35,054 tons; the make of gas per ton being 11,216 cubic feet, of which 10,358 cubic feet were sold—being an increase of 186 cubic feet in the make and 152 cubic feet in the sale compared with the preceding year. The residuals sold were: Coke and breeze, 19,608 tons; tar, 328,654 gallons; ammoniacal liquor, 768 tons. Calculated per ton of coal carbonized, the sales were: Coke and breeze, 11·19 cwt.; tar, 9·37 gallons; and sulphate of ammonia equivalent, 25·8 lbs.

The amount of capital invested in the works and plant is £229,488; being at the rate of £6 10s. 9 6d. per ton of coal carbonized, and 12s. 7·69d. per 1000 cubic feet of gas sold. The gross profit was £23,856, and the net profit, as already stated, £17,588; the former being 10·39 per cent. on the capital outlay. Worked out per ton of coal carbonized, the results are 13s. 7·33d. and 10s. 0·42d. respectively; and per 1000 cubic feet of gas sold, 1s. 3·77d. and 11·63d.

Alderman LOWE, referring, at last Wednesday's meeting of the Town Council, to the gas and electricity accounts, said the past year had been the most successful one in the history of either of the undertakings. Not only had they a larger surplus to deal with after all expenses had been paid, but the output had been increased. With regard to the gas-works, the most gratifying feature was the substantial increase in the sale of gas. The Council would remember that in 1904 they reached their then maximum, since which time there had been a decline until last year, when they began to see a revival. Last year they sold 17 million feet of gas more than had ever been sold in the town—a fact which was largely due to the policy of allowing to users of prepayment meters stoves without rent; and no doubt the supply of Stretton, Branstone, and Barton was a factor. It was a great encouragement to the management and the Committee. The cost of the coal was £18,000; and the receipts from the sale of residuals were £17,662, or 92·6 per cent. of the former sum. As to the profits, they had given £7000 to the rates; and after buying new stoves and meters, there remained £7543 to be added to reserve. The latter needed replenishment; for £7000 had been paid out towards the reconstruction of the works. Next year there would be a saving on loans of £3000; and the Committee had no hesitation whatever in reducing the price of gas 2d. per 1000 cubic feet at the next meeting of the Council. He hoped the Committee would be in a position, after having made their coal contracts, to come forward with a further reduction before the end of the year. The total cost of the reconstruction of the works was £36,000; and that it had been money well spent was amply demonstrated. When Mr. J. F. Bell advised the erection of new retort-houses at a cost of £ 20,000, he said they would save £3000 a year, and perhaps more. In 1909, the year before the work was undertaken, they made a gross profit of £16,500, and last year it was £23,000. This difference had been made through the new retort-houses. Then in 1909 the coke produced £6800, and in 1911 £10,730, or a difference of £3900; while the cost of carbonization in 1909 was £4887, and in 1911 £2178, a difference of £2709. So that in wages and coke there was an advantage of £6700. This saving had been accomplished in addition to a reduction of the price in 1909 by 3d. per 1000 feet.

After a short discussion, the report was adopted.

Gas Profits at Filey.—In presenting his annual budget to the Filey Town Council at their last meeting, the Chairman of the Finance Committee (Mr. H. Foster) said the profit on the gas undertaking in the past financial year had been £342, compared with £64 in the preceding twelve months. In view of the possible increase in the cost of coal, it was deemed advisable not to use the money in relief of the rates, but to carry the amount forward.

EXAMINATION IN "COAL-TAR DISTILLATION."

The City and Guilds of London Question Paper.

The following questions were set in the examination in "Coal-Tar Distillation and Intermediate Products" conducted by the City and Guilds of London Institute on the 2nd inst. Three hours were allowed for each paper; and not more than eight questions were to be attempted in the Ordinary Grade and six in the Honours Grade. The candidates for honours had to present themselves for a practical test on the Saturday following the written examination. The numbers at the ends of the questions are the maximum marks obtainable.

HONOURS GRADE.

1. Make a dimensioned sketch of a tar-still, condenser, pitch-cooler, and receivers, showing the method of setting and all necessary details. [50.]

2. Describe, with sketches of the plant, the process of obtaining pure, dry ammonia gas, suitable for the manufacture of anhydrous liquefied ammonia, from gas liquor. [50.]

3. Give some account of one of the following classes of bodies found in coal tar: (*a*) The nitrogenized compounds, or (*b*) the sulphuretted compounds. [50.]

4. State what you know about vertical retort tar, and explain in what respects it differs from ordinary tar obtained from horizontal retorts. To what causes may these differences be attributed? [45.]

5. You are required to manufacture 50 tons of synthetic phenol. How would you do this, and what quantities of raw material and other chemicals would you require? [50.]

6. Describe, with sketches, some modern types of fractionating columns, and discuss their relative advantages. [50.]

7. Give a short account of any two of the following processes: (*a*) Separation of the three isomeric xylenes. (*b*) Purification of crude anthracene. (*c*) Manufacture of sublimed naphthalene. (*d*) Dehydration of tar previous to distillation. (*e*) Preparation of soluble disinfecting fluids. [50.]

8. Describe the use of tar for the construction and repair of roads. What kind of material has been found to be the most suitable, and why? How would you prepare such a product? [45.]

ORDINARY GRADE.

1. Describe briefly the operation of distilling tar, explaining how the changes are made. [35.]

2. You have to design a still for the distillation of 10 tons of tar of 1·200 sp. gr., and yielding 60 per cent. of pitch. Give a rough sketch, with dimensions, of the still and pitch-cooler you would adopt. [40.]

3. Give a short account of the manufacture of lamp-black, or of briquette fuel. [35.]

4. Describe a modern fractionating column, giving sketch; and illustrate its use by describing the fractionation of light oil. [35.]

5. Commercial 90's benzol contains both carbon bisulphide and thiophene as impurities. State what you know of these bodies, and how you would treat the benzol to eliminate them. [35.]

6. Describe the manufacture of one of the following: 50-90 per cent. benzol, 50's carbolic, di-nitrobenzene, and naphthalene, and state what tests the products should be able to pass. [40.]

7. Give a short account of the application of tar to road making. What are the characteristics of a tar suitable for this purpose? [35.]

8. You are required to manufacture 5 tons of sulphate of ammonia containing 20 per cent. of nitrogen. The waste liquor, which you may assume to be 1¼ times the volume of the ammoniacal liquor used, must not contain more than 0·02 per cent. ammonia. How many gallons of 10-oz liquor must be distilled, assuming no other losses to occur, and how many tons of 142° Twaddel (78 per cent.) sulphuric acid will be required? [45.]

9. Describe the different methods in general use for the decomposition of the phenate of soda obtained from light oil or creosote, and discuss the relative advantages and disadvantages of each. [35.]

10. Describe fully how you would estimate any two of the following: (*a*) Free carbon in pitch; (*b*) water in tar; (*c*) ammonia in waste liquor; (*d*) sulphur in benzol; (*e*) tar acids in creosote; (*f*) neutral oils in crude cresylic acid. [40.]

Cape Town and District Gas Company.—The profits of this Company for the past year were £18,076; being an increase of £1472 compared with 1910. Adding the amount brought forward, there is produced a total of £19,971. A sum of £3091 has been written off for depreciation, £5444 has been transferred to the reserve and contingency account, the debenture and debenture stock interest has been provided, and the balance (£2129) will be carried forward.

York Corporation and the Gas-Works.—At the meeting of the York City Council on Monday last week, Mr. Hibbett drew attention to the cost of the opposition by the Council to the York Gas Company's Bill, and inquired if the Gas Committee had power to oppose in the next House without a special resolution. The Lord Mayor (Alderman N. Green) said there was a special resolution authorizing opposition in both Houses. Alderman Meyer (the Chairman of the Gas Committee) said the effect of the opposition was to cause the Company immediately to reduce the standard price from 2s. 10d. to 2s. 3d. If they began like this in the Lords, was it not worth going on in the Commons? Alderman Wragge complained that the House of Lords Committee had been informed that the city was anxious to purchase the gas-works. He was certain the ratepayers did not desire to do this; and he did not want any Committee of the House of Commons to be told that they wanted to buy the works until a poll of the city had been taken. Mr. Hibbett said he was thoroughly opposed to the Bill; but he thought they had gone far enough. All the witnesses represented one side only—"the municipalizers." He protested against the suggestion that the city wanted to purchase the gas-works. Mr. Hartley was certain if the facts were submitted to the ratepayers they would purchase the gas undertaking. The matter was left to the Gas Committee.

TARRED ROADS AND FISH DESTRUCTION.

Defence of Tar—Some Overlooked Causes of River Pollution.

In the last number of the "JOURNAL" (p. 394), we reproduced from the "Daily Mail" of the preceding day a rather startling communication from Mr. R. B. Marston, the Editor of the "Fishing Gazette," based on a telegram received from Mr. F. Napier Sutton, the President of the Friendly Anglers' Society, in regard to the destruction of fish in the River Colne, between Watford and Rickmansworth, as the result, it was supposed, of the passing into the river of storm water from roads which had been dressed with unpurified tar. In reproducing Mr. Marston's communication, we pointed out that his conclusion must not be accepted until strict inquiry had been made into all the circumstances; and referring to the matter in a long article in the "Daily Mail" on Wednesday, he said: "It was at first thought that this destruction—the second within a few years—of the fine fishery of the Friendly Anglers was due to road-tarring in the Watford district. This is doubtful. Some reports say that no roads have been tarred there; others that the authorities have been very busy tarring them, and are proposing to extend their operations."

That the destruction of fish in a stream must not be hastily attributed solely to the presence therein of the washings of tarred roads, is evident from a letter in reply to Mr. Marston which appeared in the "Daily Mail" on Thursday. The writer (Mr. W. J. Pickering, of Epsom) said: "A serious source of river poisoning which is entirely overlooked, and has had, and still has, a very marked effect on Thames fish, is to be found in the effluents from the numerous sewage works which pass most of their ammonia and poisonous substances into the watercourses during storms and on other occasions. I believe I am right in saying that no fresh-water fish can be got out of rivers where an appreciable proportion of their dry-weather flow is made up of sewage effluent. Here we have two great factors in the poison cup—the flies and larvæ killed by the mineral oil floating on top of the stream, and the stream itself made up of sewage effluent which sometimes is very dangerous to fish life. Viewed from the public health standpoint, road-tarring must be a great advantage wherever it is applied; for there is no gainsaying the fact that one of the most septic substances is the dust from road surfaces, and if its dispersal is prevented, the public must benefit a very great deal."

Writing in the same issue, Mr. E. Gabriel Stevenson, the Secretary of the River Darent Association, said: "Apart from the question of the tar from the roads, we have come to the conclusion that damage to the water can be traced to paper mills, rubbish heaps, and large storm-water outfalls, and that the water flowing into the stream from such sources and off the roads (sometimes in very heavy volumes when the stream is low) is seriously lacking in oxygen and contaminated with decaying organic matter, disinfectants, and oil droppings from the motors."

In a letter which appeared in our daily contemporary last Friday, Mr. F. E. Bristowe, the Chairman of the Incorporated Association of Bituminous and Other Paving Material Manufacturers, said: "It is, I think, only fair that, in discussing this matter, care should be taken not to do injustice to an industry which has entailed the spending of vast sums in experiments to remedy the dust nuisance. . . . I submit that though crude tar has proved itself a failure in many districts, and certainly an element of the greatest risk in the neighbourhood of trout streams, still pure coal-gas tar can be, and has been, used for [road] surface treatment purposes in the Isle of Wight, at Winchester, and other places, with absolutely safe results to the welfare of the fish. May I, therefore, ask that, before tar treatment is condemned entirely, either careful inquiry be made at the points indicated of what materials have been used, or those associated in the road improvement question be consulted?"

In view of the complaints that destruction of fish is often caused by the surface water from tar-sprayed roads, the following particulars taken from an article in the "Royal Automobile Club Journal" are interesting. The writer describes how boxes in which the fish eggs were hatched in a trout hatchery were painted with a preparation 75 per cent. of which was tar and 5 per cent. pitch. The little pond in which the young trout were later on placed was divided into sections by planking heavily painted with pure tar and pitch. The planks were not dry when placed in the water; but the fish thrived and fed beneath the oily scum of tar, which defied all efforts at removal.

The communications of Mr. Marston and the correspondence arising therefrom have attracted so much public notice that Major Baring, the Member for Winchester, intends to-night to ask the President of the Board of Agriculture whether his attention has been drawn to "the wholesale destruction of fish in the neighbourhood of Rickmansworth, attributed to the pollution of the water by tar from the roads; whether he is aware that numerous similar instances have been reported from other parts of the country; and whether any investigation is being made by his department."

Views of the Board of Fisheries and Agriculture.

In connection with the foregoing correspondence, it may be of interest to reproduce, from the report of the proceedings of the Board of Agriculture and Fisheries under the Salmon and Freshwater Fisheries Acts, &c., for the past year, the following remarks on

TARRED ROADS AND FISH.

Although accounts have from time to time appeared in the Press of cases of damage to fish, which have been locally attributed to washings from tarred roads, no fresh instances of the kind have been reported to the Board by any Board of Conservators since those mentioned in the last report. The circular to local authorities referred to in that report has elicited only expressions of concurrence in the suggested precautionary measures, coupled in most cases with the statement that no instances of suspected poisoning from tarred roads had come to the notice of the County Council concerned.

After the breaking-up of the drought in October, numbers of trout and grayling, blind and otherwise affected, were reported as having been found in a stretch of several miles of the Itchen, below Winchester; and the occurrence was generally attributed to this cause. It does not yet appear at all certain that this visitation was due either in whole or in part to washings from tarred roads; and it may be remarked that the Hampshire County Council have informed the Board that all tar used upon their main roads during the past summer was supplied under a stringent specification, prepared by an expert chemist, with the object of eliminating all substances which might be injurious to fish life or vegetation.

This specification is in very close agreement with the suggestions put forward in a paper recently read before the Institution of Municipal and County Engineers, which deals with the nature and composition of the various kinds of tar and pitch, and with the results of experiments as to the effect on fish life of water which has been in contact with them.* The fish experimented on were chiefly gudgeon and dace, but also included trout, grayling, pike, and perch. As the result of his investigations, the author gives it as his opinion that no harm to fish will result from the tarring of roads if only coal tar or a mixture of coal tar and carburetted water-gas tar be used, which, in either case, (1) is not of lower specific gravity at 15° C. than 1·18; (2) contains not more than 1 per cent. of water or gas liquor, the ammonia in which is equal to not more than 5 grains per gallon of tar; (3) contains not more than 1 per cent. of light oils; and (4) contains not more than 3 per cent. by volume of crude tar acids. He further recommends, in cases where the washings from tarred roads will not be diluted to at least twenty times their volume before, or immediately on, entry into fishing waters, that the maximum limit of water or liquor in the tar should be reduced to 0·2 per cent.; of ammonia, to 1 grain per gallon of tar; and of light oils, to 0·8 per cent. (or 1 per cent. of distillate below 170° C., inclusive of water).

THE AGITATION AMONG LONDON GAS WORKERS.

An open-air demonstration of members of the National Union of Gas Workers and General Labourers was held last Sunday morning at the Poplar Dock gates—Mr. Ingle Geeson presiding. Councillor Jack Jones, of West Ham, the principal speaker, referred to the presentation of a casket to the Governor of the Gaslight and Coke Company, at the Beckton Gas-Works, by certain employees who were in co-partnership, and said he could quite understand the Company talking about the happy relations between themselves and their employees. The Company had already paid in dividends twenty times their original capital; and, being richer than they ever had been, they had reason to be grateful. The dividends were made out of the exploitation of the workers, and by no other method. He knew that, when the Company made concessions some time ago, the men thought these benefits came from generous hearts; but it was only intended to prevent the men associating with the various strike movements in other industries. The Directors had invited the workers to become members of the Company's approved society under the Insurance Act. But the Union, at their conference at Sunderland at Whitsuntide, were going to give for 1d. a week 3s. extra, which was more than the workers would get for the Company's 2d. He described the co-partnership system as one in which the lion lay down with the lamb, and said nobody believed in it but the "swankers" in the House of Commons. In urging workmen to join the Union, he said the same determination which won an eight-hours day could win a six-hours day if they were all organized. The gas companies would not get six months' but only six minutes' notice of the next coal strike. He hoped next time there was a coal strike the gas workers would join it, and come out not merely in sympathy, but with demands of their own.

THE SMOKE ABATEMENT MOVEMENT IN MANCHESTER.

Deputation to the Lord Mayor—Proposed Air Purification Committee.

In support of a proposition which has been made by smoke abatement reformers that the Manchester Corporation should appoint an Air Purification Committee, a deputation representative of various branches of science, art, and industry waited upon the Lord Mayor (Mr. S. W. Royse) at the Town Hall, last Tuesday. The deputation, which was introduced by Sir Charles Behrens, Deputy Lord Mayor, included Professor Harold B. Dixon, of the Victoria University of Manchester, Dr. W. F. Dearden, Medical Officer of Health for the Port of Manchester, representing the North-Western Section of the Association of Medical Officers of Health, and Principal John W. Graham, Chairman of the Smoke Abatement League of Great Britain.

A memorial setting out the aims and objects of the deputation and those they represented was read by Mr. R. H. Clayton. It dealt first with the polluting and destroying effects of coal smoke in Manchester, especially that emanating from domestic and office chimneys, and then suggested the appointment of a Special Committee of the Corporation to take up the matter. It was added that the proposed Committee would be advisory only, and their first work would be purely one of investigation; and the results would show what could be done if such a department were established. It was suggested that the Committee should consist of representatives from the Gas, Electricity, and eight other Committees of the Corporation, together with co-opted members from scientific and other societies. Should the inquiry show that any methods were really applicable to reducing the smoke nuisance without interfering with the present rights of the citizens, then, and only at that stage, should there be a working department established, and placed under a highly trained chief, who would proceed on the lines indicated by the preliminary inquiry. Investigations by such a department would include work on stoves and fire-grates; coke, smokeless fuels, gas, and electricity; central heating and ventilation connected with hot-air, hot-water, and steam; and smokeless combustion

* "The Relation of Modern Road Surfacings to Fish Life," by W. J. A. Butterfield, M.A., F.I.C., Assoc.Inst.C.E. [See "JOURNAL," Vol. CXVII., p. 427.]

of fuel for factory purposes. After a full investigation of the various means of heating, it would be the duty of the department to instruct the citizens in smokeless methods of heating, and to organize, through the various societies, a campaign against smoke—not, however, through any legislative methods. This work would have to be done through lectures, demonstrations, canvassing, and public show-rooms in the most central position in the city, including possibly a model house showing the various systems in use.

The speakers included Dr. Dearden, Mr. John Brooke (President of the Manchester Society of Architects), and Professor Dixon. The last-named speaker said he thought it was possible that a representative Committee of some Manchester men might secure results which, without unduly hampering the industries and without extinguishing the cherished open fire—which they all worshipped—might secure results that would prevent the waste of the coal supplies, and might produce a better atmosphere for all to breathe.

The Lord Mayor, replying on the representations made to him by the deputation—the importance of which he fully recognized—said he had been listening for some proposal, for he was certain that if the leaders of scientific life in the city would make to the Sanitary Committee of the Corporation suggestions which it was possible to accept, he was quite sure the Council, through the Committee, would be ready to take them up. The smoke abatement question must be divided into two sections—one relating to smoke resulting from industrial enterprises, and the other to smoke produced by the domestic and office fire. Great benefits had been secured from the attention paid to the former problem; and it seemed to him that they should now apply themselves more particularly to the latter. He admitted that the problem was a difficult one; but it would have to be dealt with. The only remedy he had seen up to now was that of using gas in place of coal. If gas were employed more extensively for cooking, heating, and power purposes, the smoke evil would not be so pronounced as it was at present. To educate the people on this point would be a step in the right direction. It was his contention that if they utilized scientific discoveries, gas could be made more economically—certainly more economically than was possible ten or twenty years ago. He was of opinion that it was in this direction that they ought to go; for the cheaper the gas the more of it would be used for the purposes he had named. Bye-products were becoming more and more valuable, and therefcre gas should be sold cheaper. If this were done, he thought they could do something with advantage in the way of smoke abatement, which would at the same time be to the benefit of the community. There was the possibility of making at a cheap rate gas of low illuminating quality which was quite serviceable for heating and power purposes, as well as for lighting by means of the incandescent mantle. He did not know how the Sanitary Committee would regard the proposition put forward; but he had no doubt the members would carefully consider all that had been said in support of it. He warned the deputation, however, not to expect any commitment from the Corporation just at present; but he would say this for himself, that if it were found that a standing Committee, as suggested, could be appointed with advantage to the city, both for industrial and domestic purposes, he would be very glad to support it.

Thanks having been tendered to the Lord Mayor for having received the deputation, the proceedings concluded.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.

The provisional estimates of the Cleaning and Lighting Committee of the Edinburgh Town Council for the year 1912-13 were submitted at the meeting of the Town Council on Tuesday. The total for lighting is £45,415, as against an actual expenditure in 1910-11 of £44,608. Gas-lamps are responsible for £17,895, and the lighting of common stairs by gas £12,700.

At Tuesday's meeting of the Edinburgh Corporation, a letter was submitted from the Clerk to the Edinburgh and Leith Corporations' Gas Commissioners intimating that the Commissioners were willing to continue the present price of gas used for public lighting in Edinburgh for the year from Whitsunday, 1912, the price to be 2s. 3d. net per 1000 cubic feet, and 2s. 7d. net for flat-flame lighting.

The Edinburgh and District Water Trust have not yet made up their minds as to mechanical or sand filters at Fairmilehead. It is proposed to fall in with the scheme of joint collection of rates, as suggested by the Edinburgh Corporation.

Glasgow.

A motion will shortly come before the Glasgow Town Council advocating that, in view of the great success achieved by the Gas Department in retailing coke in small quantities during the recent coal strike, the Corporation should instruct the Gas Committee to make the necessary arrangements whereby the scheme then inaugurated can be improved and continued—thus giving the citizens an opportunity of purchasing coke in small quantities at a reasonable price.

The Glasgow Corporation gas supply is, after all, not beyond criticism. At the moment, indeed, it centralizes a rather lively correspondence in the local Press. The authorities maintain the dignity of silence regarding the criticism, which for the present purpose may be summarized. The initial letter stated that the correspondent was very much surprised to find that the charges on householders and power users is enormously in excess of that which rules in Sheffield, where he comes from. He holds that when one learns that the householder in Glasgow pays for his gas 1s. 11d. per 1000 cubic feet, and in Sheffield only 1s. 3d., some explanation is surely necessary from the Gas Committee. One fact is patent, the writer continues, and that is that the Corporation are taking undue advantage of the small user,

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who is paying too much. The attention of Parliament ought, he says, to be directed to the present state of affairs. In Sheffield, where there is a Gas Company, the rights of the users are safeguarded against over-charging, because whenever the Company's dividend is more than 10 per cent., and the reserve fund upwards of £80,000, the price of gas must be reduced. Users of gas for power in Sheffield are only charged 1s. per 1000 cubic feet; and the consequence is that hundreds of works which would have erected gas-producers had the price been as high as it is in Glasgow use town gas. In the course of the subsequent correspondence, the following remark appears: "I remember some time ago, when the Council were discussing the advisability of supplying gas-stoves free, some of the members advocated cutting down the price of gas to 1s. 6d. per 1000 cubic feet; but the most advanced section carried the free-stove proposition. I think cheaper gas would make more people use it, especially if it were suddenly reduced to 1s. 3d. per 1000 feet."

Aberdeen.—At the meeting of the Aberdeen Town Council on Wednesday, an application was received from the gas inspectors for an increase in wages. The application was left in the hands of the Gas Committee for consideration and report. At the same meeting, the Peterhead Town Council applied for, and were granted, the services of Mr. Samuel Milne, the Gas Engineer, in connection with the gas-works at Peterhead.

Cowdenbeath.—The Cowdenbeath Gas Company, through their Agent, were making complaint at the Town Council meeting on Thursday of being assessed for water on the full amount, and appealing against paying more than a fourth. The matter was remitted to the Finance Committee.

Culross.—The Gas Committee of the Dunfermline Town Council have unanimously recommended the laying of a high-pressure main to Culross.

Dundee.—Early on Monday morning, a man named Martin Dolan, a labourer, was found dead at his residence in North Erskine Street, with a gas-pipe in his mouth.

Dunoon.—Mr. William Rodger, the Burgh Engineer of Dunoon, has just completed an important invention for the extraction and destruction of sewer gas; and a burner apparatus is at present in use on one of the lamps in Dunoon, and is giving entire satisfaction. There is fitted into the interior of the lamp-head a combustion chamber for sewer gas; the chamber being in the form of a two-part cone—the lower portion of the cone being carried through the base of the lamp-head, and suitably connected to the upper part of the lamp standard, the upper portion of the cone being made to fit the lower portion and suitably tapered, and also fitting lightly the upper portion of the lamp-head. In the interior of the upper portion of the cone is fitted a baffle-plate, and below this is located a bunsen or other suitable burner, fed from the main gas supply through a bye-pass; so that the bunsen will be kept alight even when the supply to the illuminating burners is cut off. The sewer gas is led to the lamp standard, and passes upwards into the cone; being partly burnt below the baffle-plate, and any escaping gas being consumed above the plate.

Inveraray.—It is stated that the Duke of Argyll has bought the house and grounds connected with the Inveraray Gaslight Company.

Johnstone.—A burning accident which resulted in the death of a girl—Julia Purdie, aged 9—occurred on Monday. She was working at the gas-stove in her father's house, when her clothing caught fire.

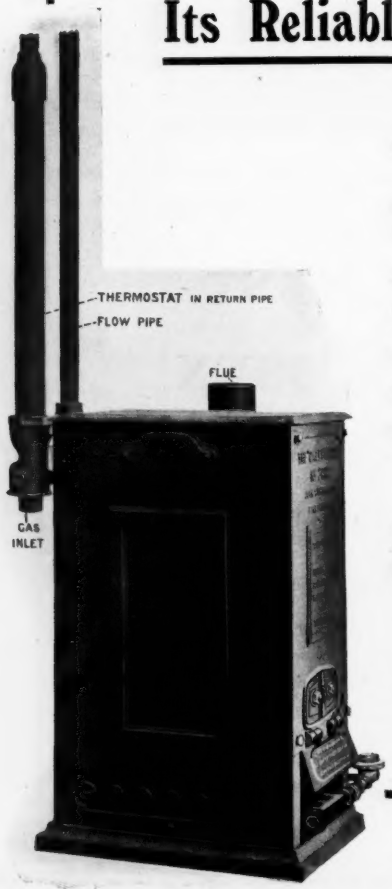
Montrose.—At the meeting of the Town Council of Montrose on Monday, the Lighting Committee reported that, in connection with a proposal to light Coronation Avenue, a letter had been received from the Electric Light Company to the effect that they had no objection to the Avenue being lighted with gas, but that, as they had a cable running as far as the entrance to the road leading to Wardhouse Farm, any lamps situated within 75 yards of the cable should be lighted by them, in accordance with the agreement between them and the Council. The Committee recommended the lighting of the avenue by the Gas Company, and that the Electric Light Company should light the lamp at the entrance of the road leading to Wardhouse Farm. After considerable discussion, the matter was delayed for a month.

Thornton.—The whole of the plant has been erected, and the main-pipes completed, in connection with the supply of gas to Thornton from the Kirkcaldy Gas-Works. In about a fortnight's time, it is expected that a beginning will be made with the distribution of gas.

Uddingston.—An extension of the Uddingston gas supply is being made to Fallside.

A Gas Collector's Embezzlement.—At the Warrington Borough Police Court, last Friday, William Briggs, who had been in the employ of the Gas Committee as a prepayment meter collector, pleaded guilty to embezzling various sums of money on different dates, and was sentenced to three months' hard labour. It was mentioned that the total defalcations amounted to nearly £50. On behalf of the prisoner, it was stated that he had got into the hands of moneylenders.

Gas Exhibition at Bolton.—With the object of popularizing cooking by gas, the Bolton Corporation opened an exhibition last week in the Olympia Rink, in order to bring before the householder the many domestic purposes to which gas may be put. In declaring the exhibition open, the Mayor (Alderman Dr. Young) referred to the use of gas in connection with smoke abatement. He said the mill chimneys were not the only sinners. If the audience went on the hills around Bolton when there was no wind they would see hanging over the town a pall of smoke, a great deal of which came from house chimneys. By a more extended use of gas, they would be able to avoid much of this smoke. He congratulated the Gas Committee, their Chairman (Alderman Webster), and the Engineer (Mr. W. J. Smith) on having this exhibition, whereby the public could see the improvements that had been brought about in gas appliances. Arrangements have been made for cookery lectures by Miss Barker twice daily, and also for demonstrations in paper-bag cookery.



Its Reliable Automatic Gas-Valve.

When required, we fit a luminous burner and our Patent Thermostat to

The CALEFACTOR

as being more economical for continuous work, where the apparatus is merely maintaining the temperature of the storage water ready for immediate use, the duty which occupies most—usually three-fourths—of its time.

This combination has been in use for many years on our "Sun" Boiler and has **never failed.**

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

Test the Calefactor.

33.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, *May* 11.

Throughout the week there has again been a paucity of fresh orders from actual consumers, and the business that has taken place has been principally for the covering of contracts made previously. Consequently, values have continued to show a drooping tendency, and the market closes with a quiet tone at £14 12s. 6d. to £14 13s. 9d. per ton f.o.b. Hull, £14 13s. 9d. to £14 15s. per ton f.o.b. Liverpool, and £14 15s. to £14 16s. 3d. per ton f.o.b. Leith. For future delivery, there has been considerable inquiry, but the prices required by manufacturers have proved prohibitive to first-hand business. It is reported, however, that a fair volume of trade has been done by dealers for shipment July-December this year and January-June, 1913, at from 7s. 6d. to 10s. per ton below the quotations for prompt supplies.

Nitrate of Soda.

The market for this article remains very firm, and the present values on spot are 11s. 1½d. per cwt. for ordinary, and 11s. 3d. for refined quality.

Tar Products.

LONDON, *May* 13.

The markets for tar products remain without alteration, but on the whole prices are exceedingly firm. There is still a considerable demand for pitch for both prompt and forward delivery; and it certainly looks as if higher prices will be seen. Benzols are steady; but there is not a large amount of business doing. Solvent and heavy naphtha are in good demand, and prices are very steady. Creosote is also in good request for both prompt and forward delivery, and shows no signs of weakening. In crude carbolic, little business is reported at the equivalent of 2s. 4d. to 2s. 4½d. for 60's f.o.b.; but this is for forward delivery.

The average values during the week were: Tar, 28s. to 32s. *ex* works. Pitch, London, 53s. to 54s. 6d.; east coast, 52s. 6d. to 54s.; west coast, Clyde 53s. 6d. to 54s. 6d., Manchester 51s. 6d. to 53s. 6d., Liverpool, 52s. 6d. to 53s. 6d. Benzol, 90 per cent., naked, London, 11d. to 11½d.; North, 10¾d. to 11d.; 50-90 per cent., naked, London, 10d.; North, 9½d. Toluol, naked, London, 10d. to 10½d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4½d. to 5d.; North, 3¾d. to 4½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d. f.o.b.; North, 11d. to 11½d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 2⅞d. to 3⅛d.; North, salty, 2⅛d. to 2⅜d.; liquid, 2⅜d. to 2¾d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 4d. to 2s. 5d. Naphthalene, £4 10s. to £9; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

Towards the close, there was a little more inquiry, which has been the means of steadying the price. Actual Beckton is quoted at £14 5s. Outside London makes are £14; Liverpool, £14 17s. 6d.; Leith, £14 18s. 9d.; Hull, £14 16s. 3d. to £14 17s. 6d.; Middlesbrough, £14 16s. 3d.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is quiet after the fall in prices mentioned last week; and the advance in the sea freights on the lack of ready steamers has its influence on the coal markets. In steam coals, best Northumbrians are about 14s. 9d. to 15s. per ton f.o.b.; second-class steams are 13s. 6d. to 14s.; and steam smalls are about 9s. 6d. to 10s. The production at the collieries is full; and there is a fair export, though it is checked in its rapidity by the delay of steamers. In the gas coal trade, the demand is now less for local consumption; but the stocks are being added to, and the exports are full. Best Durham gas coals are about 14s. 9d. per ton f.o.b., and seconds from 14s. per ton; while for "Wear specials," the current quotation is somewhere about 16s. 6d. per ton f.o.b. The Stockholm Gas-Works are now in the market for their supply—some 90,000 tons of Durham gas coals being asked for. There is also an inquiry from St. Petersburg for 67,000 tons, the tenders for which are to be received in a day or two. At Genoa, about 23s. is asked for cargoes of gas coal; but buyers hold off for concessions. In the coke trade, the demand is full. Good gas coke is now quoted at 15s. per ton f.o.b. on the Tyne or Wear.

Scotch Coal Trade.

There has been an all round relapse in Scotch coal prices during the week, and a closer approximation as between supply and demand. On Saturday, the prices in Glasgow were: Steam coal, 12s. to 12s. 6d. per ton f.o.b.; splint, 12s. 6d. to 13s. 6d.; ell, 12s. to 12s. 6d.; trebles, 12s. 6d. to 13s.; doubles, 12s. to 12s. 6d.; and singles, 12s.

Middleton Corporation Gas Profits.—The balance-sheet of the Gas Department of the Middleton Corporation shows a net profit on the year's working of £3149, which is considered very satisfactory, having regard to the extra cost of fuel during the coal strike and loss of revenue in a lessened supply of gas. The amount received for gas sold in the twelve months was (less discounts and bad debts) £20,026, and residual products realized £6168—coke accounting for £4153 3s. 10d. of this total. The Department paid £1094 for interest on loans and £2255 to annuitants, and placed £3445 to sinking fund account.

WE want every GAS MANAGER to become better acquainted with

CARRON Gas Cookers

because we know of the Service they give, and the Satisfaction they bring. YOU will find the ***Carron Service*** a valuable asset to your Company.

One Cooker order will convert ***you*** to ***our*** way of thinking.

LISTS FREE.

CARRON COMPANY INCORPORATED BY ROYAL CHARTER 1759

CARRON, STIRLINGSHIRE,
and Phœnix Foundry, Sheffield.

LONDON (City)—15, Upper Thames Street, E.C.; (West End)—23, Princes Street, Cavendish Square, W., and 3, Berners Street, W.; LIVERPOOL—22-30 Redcross Street; MANCHESTER—24, Brazennose Street; BRISTOL—6, Victoria Street; NEWCASTLE-ON-TYNE—13, Prudhoe Street; BIRMINGHAM—218, 220, 222 Corporation Street; GLASGOW—125, Buchanan Street; EDINBURGH—114, George Street; DUBLIN—44, Grafton Street.

Manchester City Council and Grants from Trading Committees.

A special meeting of the Manchester City Council will be held to-morrow for the purpose of dealing with the estimates for the current year; and it is pretty curtain that considerable discussion will take place with regard to the amounts proposed to be handed over by the trading departments in relief of rates. In a report which the Finance Committee have prepared, the opinion is expressed that "the sums proposed to be handed over by the Gas, Electricity, and Tramways Committees are not so large as might be contributed by these undertakings." The contribution of the Gas Committee, considering that gas for street lighting is to be supplied at cost price, is equivalent to the £50,000 given last year; and that of the Electricity Committee, based on 1 per cent. of the outstanding mortgage debt, is £5487 less. The Finance Committee do not agree with this basis of contribution. "As matters stand at present," says our Manchester Correspondent, "the Council are faced with an increase in the rates to the extent of 2½d. compared with last year; and it is evident that an attempt will be made to squeeze the trading departments for larger grants than have been decided upon, so that the actual rate increase may not be more than 1d. in the pound. It is of interest to note, from the Finance Committee's report, that the concession of the minimum wage of 26s. a week to Corporation employees means £7200 increase in the wages account; and that the labour troubles last year cost the city £5868."

Carnarvon Gas Undertaking.—At the meeting of the Carnarvon Town Council last Tuesday, the Chairman of the Gas Committee (Alderman Parry) submitted an encouraging report on the working of the gas undertaking during the past financial year. It was stated that very satisfactory progress had been made in the sale of gas; the increase being greater than it had been for several years. The available cash balance at the close of the year was about £1600 on the revenue account; and the net profit amounted to £490. The net price charged for gas throughout the period was 3s. 3d. per 1000 cubic feet for lighting and 2s. 9d. for power; and in the opinion of Alderman Parry, these were the lowest prices charged by any corporation along the coast.

Poisoning by Coal Gas.—An inquiry has just been held into the circumstances attending the death of Miss Isabella Gwenilda Clegg, which occurred at the house of some relatives in Birkenhead. Deceased retired at about eleven o'clock on the night of the 5th inst., apparently in good health and spirits, but was found next morning lying motionless on her bed. There was a strong smell of gas in the room, and the gas-tap was full on. A medical man was summoned; but the unfortunate lady had been dead some hours. She was 75 years of age, short sighted, and rather deaf; and it was supposed that after she had turned off the gas she accidentally turned it on again. The Jury's verdict was to the effect that death was due to gas poisoning, but there was no evidence to show how the gas was turned on.

Regenerative Gas-Stove Company, Limited.

In another part of the "JOURNAL" will be found the prospectus of this Company, which, as briefly announced last week, has been formed with a capital of £25,000—£22,500 in 6 per cent. participating preference shares of £1 each, and £2500 in deferred ordinary shares of 2s. 6d. each—for the purpose (*inter alia*) of acquiring all the rights and patents in the Harris atmospheric gas-burners and cooking apparatus, together with the right to all future improvements. The vendors are Commercial Ventures, Limited, who are the promoters of the Company, and who have agreed to sell all the British, Colonial, and Foreign patents for the sum of £9000. The Company have secured the services for five years of Mr. A. F. Cooper, who was Manager to the late Mr. Harris, and for a like period those of Mr. J. W. Smith, formerly with Messrs. John Wright and Co., Limited, the Richmond Gas-Stove Company, Limited, and Messrs. R. & A. Main, Limited. Mr. Smith has been closely connected with the trade for upwards of thirty years, and has a wide practical experience and a very valuable connection; being personally known to the principal gas companies throughout the United Kingdom, and especially in London and the suburbs. Mr. Cooper, who is a practical gas engineer, is also well known. Subscriptions are invited for the 22,500 preference shares, as the deferred ordinary shares will be allotted as fully-paid in part payment of the purchase consideration. Attention may be called to the fact that five of the signatories of the Memorandum and Articles of Association—viz., Mr. E. M. Woods, Chairman, and Sir C. E. Moon, Captain H. B. Spence, Mr. R. D. Bartlett, and Mr. Alec Hutchison, Directors—each take 250 preference shares in the Company.

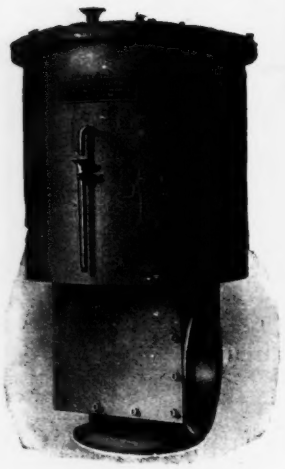
Cost of the Ilkeston Gasholder Disaster.—At a meeting of the Ilkeston Town Council on Monday last week, the minutes presented by the Gas Committee showed that, as a result of the recent disaster at the gas-works, a claim had been made against the Royal Insurance Company amounting to £4731, and claims amounting to nearly £400 had been admitted from people whose property was damaged.

South Metropolitan Gas Company's Action during the Coal Strike.—At a meeting of the Camberwell Borough Council last Wednesday, a letter was read from the Secretary of the South Metropolitan Gas Company (Mr. F. M'Leod), thanking the Council, on behalf of the Directors, for the resolution of approbation of their action in not raising the price of coke during the recent coal strike, to which reference was made in the "JOURNAL" for the 30th ult. (p. 318). Mr. M'Leod said the Directors highly appreciated the generous action of the Council; and it was a source of much satisfaction to them to know what a boon their policy was to the public institutions, manufacturers, and residents in the borough, particularly those of the poorer class. The relation between the Company and the Council had been a happy one for a long time; and it was pleasing to find that it did not diminish with years.

BRADDOCK'S

RETORT-HOUSE

GOVERNORS.



No. 193.
Braddock's Enclosed Retort-House Governor, with Internal Float.

SECOND TO NONE.

For Efficiency and Reliability.

Many Repeat Orders have been received.

No. 244. Braddock's Enclosed Retort-House Governor, Beam Type.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM,

Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.

Telegrams: "METRIQUE, LONDON." Telephone No. 2412 HOP.

Oldham Corporation Gas-Fitters' Wages.

The Oldham Corporation Gas Committee had under consideration at last Wednesday's meeting an application from the fitters for an advance in wages. In their application, the men pointed out that several years had elapsed since they last had an increase (½d. per hour), and that in the interval the cost of living had materially advanced. They asked for an additional ½d. per hour; urging that their work required more skill than formerly, and was also more laborious. In reply to a question, the Town Clerk said the fitters were now paid 8½d. an hour, and worked 59 hours a week. Mr. A. Andrew, the General Manager, answering a further query, observed that the men could only do the special work in connection with the department, and could not do ordinary plumbers' work. The Town Clerk next read a letter from the service fitters asking for an advance of wages from 7½d. to 8d. an hour. In support of their application, these men said that, owing to the nature of the work, they were compelled to take their meals away from home, which increased their cost of living. Further, that they were liable to be called out to breakdowns at any hour of the day. They said they were competent to act as plumbers, and had done so in connection with the work of the Gas Department. After some discussion, it was decided, on the suggestion of Mr. Andrew, that the consideration of the applications should be deferred until the next meeting, so that information might be obtained from other towns.

Technical Education for Gas Apprentices at Cardiff.—In his report to the Cardiff Technical Schools Committee at the meeting last Wednesday, the Superintendent (Mr. Cole) said the policy of the Committee in establishing a complete system of internal examinations had been well justified by results. The Cardiff Gas Company, as an experiment, decided at the beginning of the session to allow their apprentices to attend the "Gas Supply" classes from four to six in the afternoon. The Superintendent pointed out that if this system were more generally adopted throughout the Technical School, an enormous amount of good would be done, and employees and the community would benefit. The Chairman (Mr. J. Stanfield) said the action of the Company was to be commended.

Dismissals of Gas Workers at Stoke.—The North Staffordshire Trades and Labour Council, at their meeting at Hanley last Wednesday, passed a resolution protesting against the dismissal of certain employees at gas-works, and calling upon the Labour party on the Town Council to demand an inquiry into the circumstances. It was alleged that men who had been working for the Corporation for twenty and thirty years had been given notice to leave, and that there was nothing facing them at their time of life but the workhouse. It was urged that the Corporation had acted as no private employer would have done in discharging these old servants. Mr. H. Leese (a Councillor) said the Gas Committee had decided that the cost of producing gas at the Stoke works was too high; and had instructed the Manager (Mr. W. Prince), who said it was imperative to reduce the staff.

What a Penny Will Do.

Originality stamps the advertising methods of Mr. T. E. Pye, the Engineer and Manager of the Chichester Gas Company. We find in one issue of the local papers, occupying the centre of an advertising space, the words, with the impression of a penny in the centre of them: "The Aftermath! A Sequel to the Coal Strike. To know what One Penny will do, please see this space next week." In the same space the next week, with the impression of the penny in the centre, appears the information that a penny, at the price of gas in Chichester, will: "Cook beautifully a midday meal for three persons; or, with another penny, a joint, vegetables, and sweets for six persons. Coffee, bacon, eggs, and toast prepared for five persons for breakfast. Heat up a 25-gallon bath, or boil 3 gallons of water. Give powerful lighting for from four to five hours. Warm your room for about one hour, or over, according to size of room. No Smoke! No Soot! No Ash! No Dirt! Customers who consider they do not secure results as above are invited to communicate without delay with the Manager, Gas-Works, Chichester." An alternative form to the preliminary advertisement is also attractive. With the impression of the penny in the centre, it is worded: "Oyez! Oyez!! Oyez!!! Lost! One Penny per Hour yesterday, and every day, in certain Chichester Homes. *** For explanation, please see this space next week." The next issue contains the following explanation: "Lost! One Penny per Hour. This may be done by: Using heavy iron kettles and saucepans over gas-burners. Using the same vessels for coal-fire as for the gas-stove. Using vessels not quite clean on the outside. Using gas-burners not clean. Allowing gas-flames to ride up the sides of vessels. Not turning gas down as soon as the water boils. Allowing the top heat from the grill to be wasted. Withdrawing the vessel when water boils; instead of turning the gas down or out. Using the gas-flame much too high in the oven. Using the oven for cooking the joint only, leaving all the vegetables, &c., for the hot-plate. Using the oven for one article of food at a time, instead of packing it. For further information please apply to the Manager, City of Chichester Gas Company. (All Rights reserved as to this Series of Advertisements.)"

At the Market Hotel, Bacup, last Thursday, Messrs. Y. & W. Greenwood sold 50 preference shares (£1) in Meters Limited, which realized 20s. 9d. each; and 185 ordinary £1 shares at par.

At their meeting last Wednesday, the members of the Gas and Electricity Committee of the Rochdale Corporation passed a resolution expressing their hearty thanks to Mr. T. Banbury Ball, the Gas Engineer, and to his staff, for the efforts they put forth during the recent coal strike, especially in dealing with the extraordinary demand for coke in small quantities. The Chairman of the Gas Committee of the Malvern Urban District Council (Mr. Moerschell) and the Gas Engineer (Mr. W. J. Rendell Baker) have also been congratulated on the able manner in which they carried on the supply of gas and coke during the strike.

Gas Plant and all constructional Steel and Iron Work.

Specialists in Slot Meters, Ordinary Meters, Wet & Dry.

WILLEY & CO., LTD., ENGINEERS,

LONDON & EXETER.

The Pioneers of Slot Installations.

Gas Fittings.

Gas Fires.

Gas Cookers.

PICKERING'S VALVE. LIVESEY WASHERS.

Telegrams: "WILLEY, EXETER."

NOTE ADDRESSES.

Head Offices: EXETER.

London Offices: 18, ADAM STREET, ADELPHI, W.C.

SHOW-ROOMS: LONDON, 18, Adam Street, Adelphi, W.C.

Water Gas Allowed for Paris Suburbs.—Owing to the interruption in the supply of coal to the works of the Company having control of the gas supply in the principal suburbs of Paris, permission has been given to them to send out a mixture of coal and water gas for a period of three months, by the end of which time it is hoped the stock of coal will have been made up to its usual quantity. M. Jungfleisch, of the Hygienic Council of Paris, allows an admixture of the two gases when the carbonic oxide does not exceed 15 per cent., and when some odorizing substance has been introduced.

Remarkable Series of Thefts from Gas-Meters.—At the Southend Police Court, last Tuesday, Archibald Percy Coalbear, a chimney sweep, of Southend, was charged with stealing a door key valued at 9d. The accused pleaded "Guilty," and subsequently confessed to breaking open 35 gas-meters and stealing the contents of the money-boxes. He said it was owing to being "hard up" that he had committed the robberies, and he spent the money on food and clothes for his wife and child. He promised to make a fresh start when he came out of prison. He was sentenced to three months' hard labour.

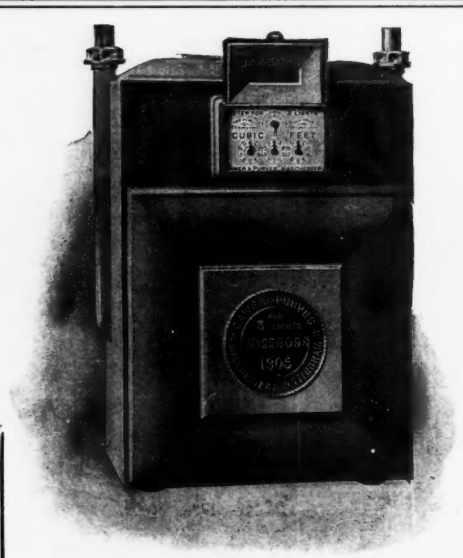
Official Gas-Meter Testing at Manchester.—Reporting to the Manchester City Justices on the work of his department for the past year, Mr. S. Dyson, the Official Inspector of Gas-Meters, states that in the twelve months 47,886 meters were tested, an increase of nearly 6000 compared with the previous year. Of this number, 817 were rejected on account of error. Mr. Dyson also reports that during the year certain meter manufacturers have introduced meters for measuring high-pressure gas for sale; and as no official means have as yet been introduced for testing the compensating indices, he thinks it is advisable for the Board of Trade to issue instructions to enable inspectors to accurately test such meters on a uniform system.

Manchester Corporation Workmen's Position under the Insurance Act.—In their annual report, the Finance Committee of the Manchester Corporation, dealing with the cost of the Insurance Act, say "there will be, no doubt, a saving in sick pay for the last quarter of the year." As any such saving must naturally be made in respect of the cost of sick pay on the present basis, it is clear that the Committee do not anticipate continuing to allow sick pay, as at present, when the Act is in operation. A member of the Committee, discussing the subject, said: "The position of the Corporation is altogether different from that of a private employer, who if he wants to be generous is so at his own expense; and if he continues to pay wages during sickness, despite the fact that he has to contribute under the Insurance Act, that is a matter for himself. But the Corporation are the custodian of other people's money, and it would be absurd to expect that the ratepayers would tolerate the principle of paying twice under the Insurance Act. Generally, the system is to pay workmen who have been not less than half-a-year in the Corporation employ half the standard rate of wages during illness. If a workman has 30s. a week, he will get 15s. per week during sickness. Under the Act, he will only get 10s.; but he will have free doctoring and advantages in case of prolonged sickness. He will, of course, have to pay his 4d. a week."

Ventilation of Gas-Cookers.—With reference to the paragraph on this subject in the last number of the "JOURNAL" (p. 395), Mr. Humphrys says he is not inclined to take the matter too seriously, as there is absolutely no positive evidence from users. He thinks it is the usual thing to fix slot cookers without hoods or flues; and he does not remember the question being raised before. There have been one or two inquiries directed to the effect of the products of combustion on the food in the oven, but not as regards the atmosphere of the kitchen. There has been no action on the part of users; and he regards the whole thing as an invention of the electric people. If pushed further, he purposes calling in an authority to make analyses of air from a few fair average houses.

Public Lighting at Torquay.—A proposal to dispense with the lighting of the street lamps at Torquay at the time of the full moon led to a discussion at the meeting of the Town Council last Tuesday. It was reported that on the 28th of March, in view of the coal strike, the Borough Surveyor (Mr. H. A. Garrett) wrote to the Torquay Gas Company, stating that the Works and Highways Committee had resolved that the gas-lamps and the small electric lamps in the streets should not be lighted on bright moonlight nights. Mr. R. Beynon, the Company's Engineer and Manager, replied that, owing to the foresight of the Directors, there was no immediate necessity to restrict the use of gas. The lamps, however, were not lighted, and Mr. Beynon, in another letter to the Surveyor, suggested that the correspondence should be published, as there was an impression abroad that the restriction of the lighting was due to the Company, and that they were short of coal. Mr. Garrett replied on the 19th of April that the Committee had no objection to the publication of the correspondence, and added that, the experiment having proved successful, they had decided to repeat it during the period of the next full moon. From the minutes of the Committee, it appeared that it was resolved that the lamps should not be lighted three days or more before and after full moon, at the discretion of the Surveyor. Mr. Hawkins, the Chairman of the Committee, said the resolution had not been carried out in its entirety on the last full moon. Complaints had come from all quarters; and the Town Clerk had advised that the lamps in the main streets should be lit, particularly as there were many men ashore from the fleet in the bay. Mr. Glanfield congratulated the Chairman on having disregarded the resolution of the Committee, and moved that, in future, the lamps should be lit all the year round. Mr. Blacker, who seconded the motion, said the putting-out of the lights was disgraceful, and reduced the town to the level of a country village. Mr. Langdon, who had seconded the motion in Committee, said they were told that in Bournemouth the streets were not lighted on moonlight nights; and it was thought that, if economy could be practised there, it might also be tried in Torquay. Mr. Hawkins understood that they were saving about £40 a week during the coal strike, and that the present intention was to light only the main streets. The resolution of Mr. Glanfield was carried; so that in future the streets throughout the town will be lighted every night.

DRY GAS METERS.



ALL SIZES STOCKED.

SAWER & PURVES,

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

WIRES { "SAWER MANCHESTER." "SAWER NOTTINGHAM."

TELEPHONE NOS. { 3289 (City) MANCHESTER. 2025 (Central) NOTTINGHAM.

Agent for Scotland: JNO. D. GIBSON, 2, Causeyside Street, PAISLEY.

Trading Profits Prevent Rate Increase at Salford.—Thanks chiefly to the assistance given by the several trading committees, the Salford Town Council will not have to increase the rates of the borough this year, as was anticipated when the estimates were under consideration. The Gas Committee are handing over out of profits £18,000, which is the same as last year; and the Water Committee, though having had a rather troublous year financially, are in a position to give £4000. The Electricity Committee, who at first proposed not to contribute anything this year because of impending heavy expenditure on plant, will give £7000; and the Tramways Committee's contribution has been increased from £18,000 to £20,000.

The Evesham Gas Committee have resolved to recommend the Town Council to reduce the price of gas from 3s. 4d. to 2s. 11d. per 1000 cubic feet.

The Gas Committee of the Bolton Corporation decided at last Friday's meeting to allocate £20,000 out of the year's profits in relief of rates; this being the same amount as was given last year.

The profits realized by the gas undertaking of the St. Helens Corporation in the past financial year amounted to £11,500; and the Town Council have decided to reduce the price of gas 2d. per 1000 cubic feet.

The tender of Messrs. Dryland and Preston, Limited, for £2444, has been accepted by the Wallasey Corporation for the construction of a purifier-house at the gas-works at Seacombe. The house will be equipped with four 30 feet by 40 feet purifiers.

The Marple Urban District Council have approved of a scheme submitted by Mr. J. K. Law, the Gas Engineer and Manager, for an improvement in the gas supply for the district of Marple. This will entail the laying of new mains at an estimated cost of £1030.

The Ashton Town Council have approved of a recommendation that the wages of lamplighters in their employ shall be advanced from 15s. to 17s. per week, and that one lamplighter shall be engaged to devote his whole time to the Lighting Department, at 24s. per week.

As the result of the altered conditions of gas supply in the district of the Bromley Town Council, it was resolved, at last Tuesday's meeting, to instruct the Town Clerk to give Dr. Samuel Rideal, their Gas Examiner, six months' notice to terminate his engagement on Dec. 31 next. Dr. Rideal has held the position since Jan. 5, 1892.

Under the Provisional Order, sanctioning an increase of capital, obtained by the Cannock, Hednesford, and District Gas Company, Limited, Mr. A. C. Fraser Wood offered for sale by auction, at the Public Rooms, Cannock, on Monday last week, 5000 shares of £1 each in the Company. They rank in every respect with those previously issued, on which a dividend of 7 per cent. per annum has been paid for the past six years; and they were sold at prices ranging from £1 8s. 6d. down to £1 5s. 6d. each—the amount realized being £6527 10s.

Messrs. Hattersley and Davidson, Limited, of Sheffield, have appointed as their gas representative for the Midlands and South of England Mr. C. Douglas Birks, who has been seven years with Mr. Charles Wood, Gas Engineer and Manager to the Bradford Corporation, first in the Engineering Department, and then for the past four years as Assistant-Chemist.

The Andalusia Water Company, Limited, has been registered with a capital of £120,000, in £1 shares, to carry on the business of a water company in all its branches in the neighbourhood of Algeciras and elsewhere in Spain, and to adopt an agreement with Mr. K. P. Hawksley for the acquisition of the concessions and rights obtained by him from the Government of Spain and the Municipal Council of Algeciras.

At the meeting of the Malvern Urban District Council last Tuesday, the price of gas was reduced by 5 per cent.—the concession to apply to prepayment as well as to ordinary consumers. The Council also complimented the Chairman (Mr. F. A. Moerschell) and the Engineer and Manager (Mr. W. J. Rendell Baker) on the admirable way in which the supply of gas and electricity was kept up during the coal miners' strike.

The Directors of Meters Limited state, in the report to be presented at the annual general meeting in Manchester next Tuesday, that the trading in the year ended the 31st of March last resulted in a gross profit of £37,777, and that the net profit was £27,502. Adding the £3068 brought forward raises this amount to £30,570, out of which interim dividends at the rate of 5½ per cent. per annum upon the preference shares and of 4 per cent. per annum upon the ordinary shares were paid in November last; and the Directors recommend the payment of further dividends at the rate of 5½ per cent. per annum upon the former and of 9 per cent. per annum upon the latter shares (making the ordinary dividend 6½ per cent. for the year), the addition of £10,000 to the reserve fund (making it £85,000), and the carrying forward of the balance of £3372.

We have received from Messrs. James Milne and Son, Limited, their new catalogue of gas-meters, pressure-gauges, compressors, and testing and other apparatus. It is on the loose-leaf principle, which enables the users from time to time to modify particular pages (with a minimum of inconvenience) as they are issued by the firm. Special attention may be drawn to their new design of prepayment meters, in both tin and cast-iron cases; also to their main-leak testing-machine, which has proved a very useful instrument for main layers. Compressors, both reciprocating, for transmission and distribution work with pressures of 5 lbs. and upwards, and rotary, for ordinary lighting installation and for distribution with pressures up to 5 lbs. per square inch, are shown. Gauges and registers also receive a considerable amount of attention; and the range of tube gauges is so large that practically any requirement can be met. The catalogue, which extends to eighty-two quarto pages, is enclosed in a stiff cover.

The Name

PARKINSON

The "CROWN."

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Stands for Perfection both in Design and Workmanship.

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THE PARKINSON STOVE CO., LD.

BIRMINGHAM & LONDON.

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange has had another quiet week with a rather dull tendency in general, owing in some measure to the languor which is not infrequently produced by the unpopular nineteen-day account. Moving factors were few. Even the lowering of the Bank rate was powerless to quicken the gilt-edged division into life and action; and Railways sulked, with one eye on labour questions and the other on the Railways Bill. The splendid weather, too, tempted people to turn their backs on the City. Monday opened rather bright, but sustained a sharp check later on. Americans were the centre of disturbance; and the depressed market had a sinister influence on others. Rails gave way; but Consols held on tight to cheap money. Tuesday was quiet and dullish. Government issues were not over strong, but Consols did not move. Rails were weaker; but the lowest prices were improved upon before the close. Foreign were as firm as anything. Wednesday brought no speeding-up in business, and the general tendency was much the same as the day before. There was not much movement perceptible on Thursday; but Government issues were firmer, and Consols were put up ⅛. Rails were inactive and not inclined to rise; but there was some recovery in Americans. Friday was another quiet day, with nothing of any importance in the leading markets, though there was some animation in speculative quarters. Consols stepped back again; and Rails were a little weaker, if anything. Saturday was quite a quiet summer Saturday. Rails were irregular, special circumstances affecting special lines. Consols again closed unchanged at 78⅛ to 78⅜. In the Money Market, the tendency became steadily easier until Thursday, when the Bank rate was lowered from 3½ per cent. (fixed on Feb. 8) to 3 per cent.—a change to some extent anticipated, and not productive of much after-effect. Business in the Gas Market was more active—a marked improvement on the previous week or two. Although not many quotations moved, there were noteworthy advances in the two leading Metropolitan Companies; and the general tone was very good. In Gaslight and Coke issues, the ordinary was in good demand. Opening at 104, it steadily rose until the closing transactions were marked at 105—a rise of 1. The secured issues were firm, the maximum realizing from 84¼ to 85 11/16 (a rise of ⅛), the preference from 102⅛ to 103⅛, and the debenture 79 and 79½. South Metropolitan was active and very strong; prices rising from 118⅜ to 122—a rise of 1⅝. In Commercials, the 4 per cent. made 108½ and 109½, and the debenture 76½. Among the Suburban and Provincial group, Alliance and Dublin fetched from 77 to 78⅛, British 44⅛ and 44⅝, Brentford new 199, Brighton original 216 and 219, Bromley "B" 99, and (on the local Exchange) Liverpool "B" 160. In the Continental companies, Imperial was done at 191⅛ to 192⅛, Union at 85, and European at 20 and 20⅛. Among the undertakings of the remoter world, Bombay changed hands at 6⅛ to 6 7/16, Cape Town at 2, ditto debenture at 77⅛ and 79, Buenos Ayres at 96, Melbourne 4⅛ per cent. at 101⅛, Primitiva at 7⅛ to 7⅝, ditto preference at 5 5/16 to 5 7/16, ditto debenture at 98⅛, and San Paulo at 11⅛ to 11¾.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	77—80	..	6 5 0
374,000	Stk.	Jan. 12	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
250,000	5	Apl. 12	7½	Bombay, Ltd.	6—6½	..	5 15 5
50,000	10	Feb. 29	15	Bourne-) 10 p.c.	28½—29½	..	5 1 8
332,000	10	"	7	mouth Gas) B 7 p.c.	16—16½	..	4 4 10
75,000	10	"	6	and Water) Pref. 6 p.c.	14—14½	..	4 2 9
380,000	Stk.	"	13	Brentford Consolidated	258—263	..	4 18 10
330,000	"	"	10	Do. New	195—200	..	5 0 0
50,300	"	"	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
206,250	"	Dec. 14	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
219,055	Stk.	Feb. 29	11	Brighton & Hove Orig.	215—220	..	5 0 0
244,200	"	"	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Mar. 28	12½	British	44⅛—45⅛	−½	5 9 11
120,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. Stk.	93—95	..	4 4 3
109,000	"	Feb. 15	6	Bromley, A 5 p.c.	128—133	..	4 10 3
165,700	"	"	4½	Do. B 5½ p.c.	98—101	..	4 9 1
82,278	"	"	5½	Do. C 5 p.c.	117—120	..	4 11 8
55,000	"	Dec. 29	3½	Do. 3½ p.c. Deb.	80—82	..	4 5 4
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	76—80	..	5 12 6
157,150	Stk.	Feb. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,380	Stk.	Feb. 29	5/9/4	Commercial 4 p.c. Stk.	108—110	..	4 19 4
560,000	"	"	5½	Do. 3½ p.c. do.	103—105	..	5 1 6
475,000	"	Dec. 14	3	Do. 3 p.c. Deb. Stk.	75—77	..	3 17 11
800,000	Stk.	"	4	Continental Union, Ltd.	82—85	..	4 14 2
200,000	"	"	7	Do. 7 p.c. Pref.	136—138	..	5 1 5
492,270	Stk.	"	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	"	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	Jan. 31	10	European, Ltd.	19½—20½	..	4 17 7
16,160,600	Stk.	Feb. 15	4/14/8	Gas-) 4 p.c. Ord.	104⅞—105½	+1	4 9 9
2,600,000	"	"	3½	light) 3½ p.c. max.	84⅛—86½	+½	4 0 11
4,063,235	"	"	4	and) 4 p.c. Con. Pref.	102—104	..	3 16 11
4,531,705	"	Dec. 14	3	Coke) 3 p.c. Con. Deb.	78—80	..	3 15 0
258,740	Stk.	Mar. 14	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16½—17*	..	6 9 5
131,000	Stk.	Mar. 14	7½	Ilford A and C	153—154	..	4 17 5
65,780	"	"	6	Do. B	123—125	..	4 16 0
65,500	"	Dec. 29	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
4,940,000	Stk.	Nov. 10	9	Imperial Continental	190—193	..	4 13 3
1,235,000	Stk.	Feb. 15	3½	Do. 3½ p.c. Deb. Red.	88—90	..	3 17 9

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219½—221½	..	4 10 3
718,100	"	"	7	Do. B.	159—161	..	4 6 11
306,083	"	Dec. 29	4	Do. Deb. Stk.	100—102	..	3 18 5
75,000	5	Dec. 14	6	Malta & Mediterranean	4¾—5	..	6 0 0
560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	"	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 10	3½	Monte Video, Ltd.	12—12½	..	5 12 0
1,775,892	Stk.	Feb. 15	4½	Newc'tle&G'tesh'd Con.	99—101	..	4 6 8
529,705	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	86—88	..	3 19 7
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
300,000	Stk.	Dec. 14	8	Oriental, Ltd.	137—139	..	5 15 1
60,000	5	Mar. 14	8	Ottoman, Ltd.	7—7½	..	5 6 8
31,800	53	Feb. 29	13	Portsea Island A	137—140	..	4 18 4
60,000	50	"	13	Do. B	130—133	..	4 17 9
100,000	50	"	12	Do. C	127—130	..	4 12 4
398,490	5	Oct. 12	8	Primitiva Ord.	7⅛—7¾	..	5 3 3
796,980	5	Dec. 29	5	Do. 5 p.c. Pref.	5½—5⅝	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 29	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
250,000	5	Apl. 12	12	San Paulo, Ltd.	11½—11¾	..	5 2 2
115,000	10	"	6	Do. 6 p.c. Pref.	11⅜—12½	+⅛	4 18 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	235—237	..	4 4 5
209,984	"	"	10	Do. B	234—236	..	4 4 9
523,500	"	"	10	Do. C	234—235	..	4 5 1
90,000	10	Sept. 28	6	South African	8—9	..	6 13 4
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	119—122	+1½	4 9 6
1,895,445	"	Jan. 12	3	Do. 3 p.c. Deb.	78—80	..	3 15 0
209,820	Stk.	Feb. 29	8½	South Shields Con. Stk.	156—158	..	5 7 7
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	"	"	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	"	Jan. 12	5	Do. 5 p.c. Deb. Stk.	119—121	..	4 2 8
502,310	Stk.	Nov. 10	5	Southampton Ord.	107—109	..	4 11 9
120,000	Stk.	Feb. 15	7½	Tottenham) A 5 p.c.	144—147	..	4 17 0
483,940	"	"	5⅝	and) B 3½ p.c.	114—116	..	4 17 0
149,470	"	Dec. 29	4	Edmonton) 4 p.c. Deb.	96—98	..	4 1 8
182,380	10	"	5	Tuscan, Ltd.	8⅛—8⅞	..	5 12 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	112—114	..	4 7 9
255,636	Stk.	"	6⅝	Wands-) B 3½ p.c.	141—144	..	4 15 6
85,766	"	Dec. 29	3	worth) 3 p.c. Deb. Stk.	71½—73½	..	4 1 8

Prices marked * are "Ex. div."

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS MANAGER. Newry Urban District Council. Applications by May 29.
SECRETARY, MANAGER, and COLLECTOR. Grange and Cartmel Gas Company. Applications by May 21.
ASSISTANT MANAGER (Brazil). No. 5566.
DRAUGHTSMAN. No. 5565.
DRAUGHTSMAN. No. 5562.
DRAUGHTSMAN. No. 5560.
AGENTS (PAINTS, &c.). Box 82, Dalross, Limited, 17, Bouverie Street, London, E.C.
REPRESENTATIVES. No. 5564.
FITTERS FOR SLOT INSTALLATIONS. "Y," No. 974, Smith's Advertising Agency, 100, Fleet Street, E.C.

Appointments, &c., Wanted.

SULPHATE PLANT MAKER AND REPAIRER. Leadburner. 15, Martin Street, Stratford.
REPRESENTATIVE. No. 5567.

Patent Licence, &c.

OBTAINING GAS FROM TAR. H. Gardner and Son, 173-5, Fleet Street, E.C.

Plant, &c. (Second-Hand), for Sale.

PURIFIERS AND WASHERS. Abertillery Urban Council.
PURIFIERS, WASHER AND ENGINE, &c., AND TOWER SCRUBBER. Cambridge Gas Company.

Plant, &c. (Second-Hand), Wanted.

WASHER-SCRUBBER. Stanley Gas Company.

Prospectus.

REGENERATIVE GAS STOVE CO. List closes May 23 and 24, for Town and Country respectively.

Stocks and Shares for Sale.

ASCOT GAS AND ELECTRICITY COMPANY. London Mart. May 16 and June 4.
BARNET GAS AND WATER CO. London Mart. June 4.
BOGNOR GAS COMPANY. London Mart. May 21.
BRIXHAM GAS COMPANY. London Mart. June 4.
BROMLEY AND CRAYS GAS CO. London Mart. June 4.
CITY OF ELY GAS COMPANY. London Mart. May 16.
CROYDON GAS COMPANY. London Mart. June 4.
EAST HULL GAS COMPANY. By Tender. May 28.
HARROW & STANMORE GAS CO. London Mart. May 21.
HERNE BAY GAS COMPANY. London Mart. May 16.
HOUGHTON-LE-SPRING GAS CO. London Mart. May 16.
HUNGERFORD GAS COMPANY. London Mart. June 4.
ILFORD GAS COMPANY. London Mart. May 21.
LOWESTOFT WATER AND GAS CO. London Mart. May 21.
MID KENT WATER COMPANY. London Mart. May 21.
MITCHAM & WIMBLEDON GAS CO. London Mart. June 4.
SOHAM GAS COMPANY. London Mart. June 4.
TENDRING HUNDRED WATER CO. London Mart. May 21.
WHITCHURCH GAS COMPANY. London Mart. June 4.
YORKTOWN, &c., GAS COMPANY. London Mart. May 16.

TENDERS FOR

Benzol and Benzolized Creosote.

DARWEN GAS DEPARTMENT. Tenders by May 22.
LEIGH (LANCS.) CORPORATION. Tenders by May 21.
WALSALL CORPORATION. Tenders by May 20.

Coal and Cannel.

BURTON-ON-TRENT TOWN COUNCIL. Tenders by May 22.
PEMBROKE DOCKS, &c., GAS CO. Tenders by May 28.
TYLDESLEY URBAN COUNCIL. Tenders by May 31.
WREXHAM GAS COMPANY Tenders by June 1.

Condensers.

BURNLEY GAS DEPARTMENT. Tenders by May 29.

General Stores (Lead Pipe, Pig Lead, Lime, Brass Fittings, Vitriol, Retort Castings, &c.)

DARWEN GAS DEPARTMENT. Tenders by May 22.
LEIGH (LANCS.) CORPORATION. Tenders by May 21.
MARPLE GAS DEPARTMENT. Tenders by May 23.
TYLDESLEY URBAN COUNCIL. Tenders by May 31.
WALSALL GAS DEPARTMENT. Tenders by May 20.

Meters.

TYLDESLEY URBAN COUNCIL. Tenders by May 31.

Oil for Gas Manufacture.

LEIGH (LANCS.) CORPORATION. Tenders by May 21.

Pipes (Wrought and Cast), &c.

DARWEN GAS DEPARTMENT. Tenders by May 22.
LEIGH CORPORATION. Tenders by May 21.
MARPLE GAS DEPARTMENT. Tenders by May 23.
SUTTON (SURREY) GAS COMPANY. Tenders by June 3.
TYLDESLEY URBAN COUNCIL. Tenders by May 31.

Tar and Liquor.

BRIDGEWATER COLLIERIES COKE-OVENS. Tenders by May 24.
BURTON-ON-TRENT TOWN COUNCIL. Tenders by May 22.
DARWEN GAS DEPARTMENT. Tenders by May 22.
MARPLE GAS DEPARTMENT. Tenders by May 23.
RHYL URBAN DISTRICT COUNCIL. Tenders by May 28.
TYLDESLEY URBAN COUNCIL. Tenders by May 31.